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Adoption of Interorganizational Business Process Standards in Business-to-Business Integration: An Exploratory Study

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ABSTRACT

We conducted an exploratory study to understand the factors that played important role in the adoption of RosettaNet-based interorganizational business process standards (IBPS) in business-to-business integration (B2Bi). We found 3 sets of drivers of IBPS adoption in organizations—i.e., external, internal, and instrumental. External factors include institutional pressures, standards uncertainty, and quality of interorganizational relationships. Internal factors include internal pressures, job change, technology readiness, ICT competence, and organizational culture. Finally, instrumental factors include perceived benefits, process compatibility, and complexity.

Key-words: Business process, Process standards, Interorganizational business process standards, RosettaNet, Interorganizational relationships, Business-to-business integration, Adoption.

RÉSUMÉ

Cet article est une étude exploratoire pour identifier les facteurs qui jouent un rôle important dans l'adoption des normes de processus d'affaires basés sur Rosetta-Net servant à l'intégration inter-entreprises. Elle met en évidence trois ensembles de facteurs – externes, internes et instrumentaux – d'adoption de ces normes. Les facteurs externes incluent les pressions institutionnelles, l'incertitude sur les normes et la qualité des relations interorganisationnelles. Les facteurs internes incluent les pressions internes, le changement de métier, la préparation de l'infrastructure, les compétences informatiques et la culture organisationnelle. Enfin, les facteurs instrumentaux incluent les bénéfices perçus, la compatibilité des processus et la complexité.

Mots-clés: Processus d'affaires, Normes de processus, Normes de processus d'affaires inter-organisationnels, Relations interorganisationnelles, Intégration inter-entreprises, Adoption.

1. INTRODUCTION

An interorganizational linkage enabled by information and communication technology (ICT) is a special form of relationship in which an organization conducts business transactions and exchanges information with its trading partners using interorganizational systems (IOSs). Such interorganizational capabilities have been touted as one of the critical success factors for organizations (Malhotra *et al.*, 2005; Premkumar, 2000; Rai *et al.*, 1997, 2006; Sambamurthy *et al.*, 2003; Teo *et al.*, 2003; Venkatraman, 1994). Investment in ICTs that enable such linkages is soaring and more and more organizations are jumping on the bandwagon (Folio and O'Connor, 2003; Rai *et al.*, 2006). However, interorganizational relationships and implementation of ICTs to enable these relationships will not be beneficial to organizations if there is a lack of integrated and/or coordinated ICT-enabled business processes shared by trading partners (Chabrow and Sullivan, 2004). Recent reports have suggested that more than 60% organizations in the United States (U.S.) maintain interorganizational relationships through manual processes and disconnected ICT systems (Wailgum, 2006). Interorganizational business process standards (IBPS)—the adoption of a set of standard ICT-enabled business processes in interorganizational relationships—have recently been suggested as a key driver of successful business-to-business integration (B2Bi) and improved performance (Capgemini, 2004; Gosain *et al.*, 2003, 2004-5; Ogden *et al.*, 2005). Therefore,

it is vital for researchers and practitioners to gain a deep understanding of the adoption IBPS in B2Bi contexts.

Notwithstanding the rich body of research on ICT-enabled interorganizational relationships, there is little research on IBPS in the context of B2Bi. Much prior research in this area has focused on the implementation of ICT-enabled IOSs and relationship-specific governance issues (e.g., Chwelos *et al.*, 2001; Lee *et al.*, 1999; Malhotra *et al.*, 2005; Premkumar *et al.*, 2005; Rai *et al.*, 2006; Subramani, 2004; Subramani and Venkatraman, 2003; Teo *et al.*, 2003). While the critical role of standardization and business processes has been recognized in prior research, the focus has largely been limited to technology standards and process-related factors—e.g., process integration, process specificity—that do not require the adoption of IBPS (e.g., Malhotra *et al.*, 2005; Rai *et al.*, 2006; Subramani, 2004; Venkatraman, 1994; Zhu *et al.*, 2006). We extend prior research on business process in B2Bi, and adoption and use of IOS (e.g., Chwelos *et al.*, 2001; Premkumar *et al.*, 1994; Teo *et al.*, 2003) and standards (e.g., Zhu *et al.*, 2006) in organizations by examining the adoption of IBPS in B2Bi contexts. Our research question is: *what are the factors influencing managerial decisions regarding the adoption of IBPS in B2Bi?*

In this paper, we report an exploratory qualitative study in which we gathered interview data from managers in 56 organizations. The paper proceeds as follows. First, we discuss interorganizational relationships, with a

particular emphasis on IBPS. Next, we present the method and discuss RosettaNet IBPS. We then present the results, followed by discussions of contributions, implications, and several possible future research directions.

2. BACKGROUND

Research on interorganizational relationships is diverse and spread across various disciplines including, but not limited to, information systems (IS), operations management, strategic management, and marketing. The IS research on this topic can be organized into two primary streams: (1) implementation and use of specific technologies and innovations that enable B2Bi such as electronic data interchange (EDI; e.g., Hart and Saunders, 1997; Lee *et al.*, 1999; Raghunathan and Yeh, 2001; Riggins and Mukhopadhyay, 1999; Srinivasan *et al.*, 1994; Teo *et al.*, 2003); and (2) relationship and governance issues in the context of ICT-enabled interorganizational relationships and subsequent organizational performance (e.g., Bensaou, 1999; Choudhury, 1997; Hart and Saunders, 1998; Malhotra *et al.*, 2005; Rai *et al.*, 1996, 2006; Riggins *et al.*, 1994; Sambamurthy *et al.*, 2003; Son *et al.*, 2005; Subramani, 2004). Recently, IS researchers have started to investigate the role of *standards* in the context of interorganizational relationships (e.g., Zhu *et al.*, 2006). Much prior research has focused on various forms of ICT-enabled interorganizational arrangements—e.g., EDI, Internet-based IOS—that require high technology

standardization but little or no process standardization (Badakhchani, 2004; Gosain *et al.*, 2003; Saeed *et al.*, 2005; Zhu *et al.*, 2006). However, little systematic research has been conducted on B2Bi that involves process standardization, which is the focus of our research.

2.1. Interorganizational Business Process Standards in B2B Integration (B2Bi)

A standard is defined “as a set of technical specifications adhered to by a producer, either tacitly or as a result of a formal agreement” (David and Greenstein, 1990, p. 4). The role of standards in the context of technology innovation and diffusion has been studied for a long time, primarily by economists (e.g., David and Greenstein, 1990; Farrell and Saloner, 1985). In B2Bi contexts, most recent IOS use unsponsored or open standards technologies, such as TCP/IP-based Internet for communication and XML for data standards (Zhu *et al.*, 2006). EDI is an example of a negotiated standards-based IOS using data standards developed by agencies such as the American National Standard Institute (ANSI), while Analytical Systems Automated Purchasing (ASAP) developed by the American Hospital Supply Corporations (AHSC) is a sponsored or proprietary standards-based IOS (Gosain *et al.*, 2003; Zhu *et al.*, 2006). Much of the standardization effort in the B2Bi space is limited to technology standards. While *technology standardization*—the degree to which trading partners implement compatible technologies—was instrumental to the

initial adoption and diffusion of IOSs in B2Bi contexts, it has been suggested that *process standardization* will be the key to improved collaboration and coordination among trading partners (e.g., Gosain *et al.*, 2003, 2004-5; Markus *et al.*, 2006).

A process is defined as “a specific ordering of work activities across time and place, with a beginning, an end, and clearly identified inputs and outputs: a structure for action” (Davenport, 1993, p. 5). Business processes are essentially a logical organization of interrelated tasks (i.e., the way a specific business activity is supposed to be done) performed to achieve a defined business outcome (Davenport, 2000; Davenport and Short, 1990; Earl *et al.*, 1995). In B2Bi contexts, an organization may have two types of business processes—i.e., *public* and *private* (Harmon, 2003). Public business processes involve interactions with the trading partners—e.g., exchange of business messages—while private business processes are internal to the organizations—e.g., interaction with internal back-end systems (Badakhchani, 2004; BEA, 2004). IBPS are defined as technical specifications for interrelated, sequential tasks and business documents that are agreed upon and shared by trading entities to achieve a defined and common business objective (Bala and Venkatesh, 2007). IBPS are standards only for public processes and private processes are typically beyond the scope of IBPS (Bala and Venkatesh, 2007; Cartwright *et al.*, 2005).

A simple business process such as *requesting price and availability of a product*,¹ for example, may have both public and private components (e.g., Badakhchani, 2004; Harmon, 2003). The buyer’s request for price and availability of a product from the supplier is an example of a public process. When the supplier checks the price and availability of the product in its internal systems, a private business process is initiated. In the above example, if the public business processes are not standardized and integrated (e.g., having no clearly defined dialog between the trading partners), it is possible that organizations will have *different* implementations of these processes for every trading partner. Implementation of IBPS enables organizations to engage in B2B exchanges with multiple trading partners without altering their private and public business processes (Badakhchani, 2004).

IBPS are different from other process-related constructs—e.g., *process integration*, *process specificity*, and *process alignment*. Process integration is a coordination of public business processes and adoption of associated governance mechanisms between the trading partners (Rai *et al.*, 2006) and may not be based on any open process standards. Process specificity—a form of intangible asset specificity—is the degree to which an organization alters its processes to align with its dominant trading partners in order to develop an idiosyncratic relationship to gain competitive advantage (Subramani, 2004;

1. Later, we will explain how this process can be standardized.

Subramani and Venkatraman, 2003; Zaheer and Venkatraman, 1994). While IBPS may reduce asset specificity when adopted by multiple organizations, process specificity always remains relation-specific. Finally, process alignment is defined as the “degree of fit between business processes and the underlying technology to facilitate online transactions and information sharing” (Barua *et al.*, 2004, p. 589). These processes are usually internal and not based on open process standards.

2.2. Technology Standards Versus Business Process Standards

While the focus of much prior research is on product (i.e., technology) standards such as video technology standards (e.g., VHS), optical storage format standards (e.g., DVD), and data format and communication standards (e.g., TCP/IP, XML), quality standards (e.g., Total Quality Management—TQM, Six Sigma) have gained prominence in research (e.g., Hackman and Wageman, 1995; Powell, 1995; Westphal *et al.*, 1997). These quality standards are different from IBPS in that these represent organizational *practices* to continuously improve key business processes and add value to customers by identifying and solving problems in a structured way and empowering employees (Ravichandran and Rai, 2000; Westphal *et al.*, 1997). These practices cut across multiple business processes to help improve and measure process performance, but do not represent the logical flow of activities of a single business process per se (Davenport, 2005).

IBPS are different from technology standards in at least three important ways. First, IBPS are specifications for business processes which are conceptually distinct from technology artifacts. A business process is essentially a specific ordering of work activities and/or events with a clear beginning, an end, and distinctly identified inputs and outputs (Davenport, 1993; Mackenzie, 2000). In contrast, a technology artifact represents the “bundles of material and cultural properties packaged in some socially recognizable form” as means to improve human performance (Orlikowski and Iacono, 2001, p. 121). Second, drawing on the theory of IS innovation (Swanson, 1994), technology standards (e.g., TCP/IP, XML, and UML) are typically for infrastructural technologies that represent the *technical core* of all types of IS innovations (Grover *et al.*, 1997; Swanson, 1994). In contrast, IBPS are related to the Type IIIc innovations that help organizations effectively integrate and coordinate with their trading partners and customers (e.g., IOSs such as EDI). Type IIIc innovations, such as EDI and other IOSs (e.g., collaborative inventory management systems, customer relationship management systems), help organizations use ICT in boundary activities and to maintain interorganizational relationships with external stakeholders. These innovations create relationship-specific assets for organizations involved in interorganizational relationships (Swanson, 1994). Finally, from a change management perspective, implementation of IBPS requires substantial changes in organizational routines (i.e., public processes) to conform

to the specifications of the standards. As noted earlier, more than 60% organizations in the U.S. still maintain B2Bi using manual processes and methods (e.g., phone, fax, e-mail). Adoption of IBPS may cause major changes to business processes in these organizations. Such process changes are often *revolutionary or discontinuous and disruptive* as the sources of the changes are external (see, Jarvenpaa and Stoddard, 1998). While the adoption of technology standards may also require changes in organizational routines and work processes, organizations typically have an option to adapt or customize these technologies to align with their existing routines and work processes. However, when implementing IBPS, organizations may not have the option of changing the IBPS to fit with existing work processes as IBPS are pre-specified standards.

Figure 1 presents the trajectory of ICT-enabled interorganizational relationships and the role of standards—i.e., technology and process—in the context of these relationships. Consistent with Zhu *et al.* (2006), the figure shows the progression of intergenerational relationships from paper-based systems to IBPS-based IOS. While it is theoretically possible that organizations can adopt IBPS and still

use legacy EDI systems, our review of prior research and trade press articles suggested that most organizations that use EDI systems have not implemented IBPS. EDI systems are typically batch-transaction based systems and have no capability to provide real-time data. IBPS are designed to create seamless linkages between trading partners to facilitate exchanges of real-time data. Much prior research has focused on various forms of ICT-enabled interorganizational arrangements—e.g., EDI, Internet-based IOS—that require high technology standardization but little or no process standardization (e.g., Zhu *et al.*, 2006). However, little systematic research has been conducted on the adoption of interorganizational relationships arrangements that involve process standardization.

2.3. Adoption of IBPS in B2Bi

Prior research has suggested that top management views standards that encompass various business rules and procedures and enable interorganizational business processes in a robust and flexible manner as being more important than other types of standards—e.g., technology standards (Gosain *et*

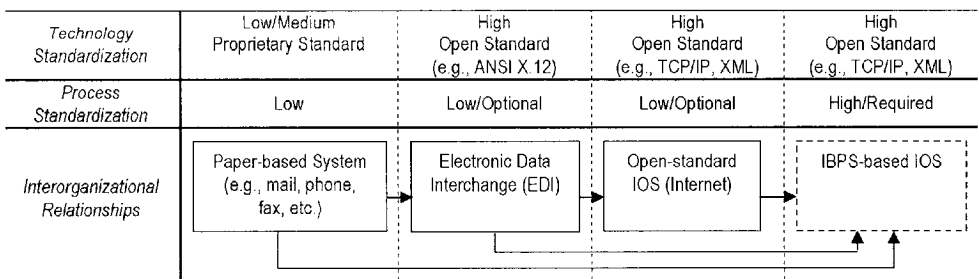


Figure 1: The Role of Standards in Interorganizational Relationships.

al., 2004-5; Malhotra *et al.*, 2005). Nevertheless, the adoption of IBPS or any other process related innovations in B2Bi contexts has been slower than expected (see for example, Barua *et al.*, 2004). While IBPS in B2Bi may offer a set of key benefits for organizations—e.g., reduction of environmental uncertainty, increasing information transparency, economies-of-scale, and higher reliability in interorganizational activities (Gosain *et al.*, 2003)—like any other organizational innovation, it is not a panacea for successful B2Bi. Implementation of IBPS is more complex than the implementation of Internet-based IOS for several reasons. Process changes are complex organizational activities that require an assessment and understanding of existing processes and formulation of new processes that are structurally and culturally compatible with the organization (Davenport, 2000; Grover *et al.*, 1995). There is significant evidence that process changes even *within* an organization often fail (e.g., Grover *et al.*, 1995; McCormack and Johnson, 2003). If process changes within organizations are so difficult to implement, then adoption of externally-developed IBPS and integrating with internal processes is going to be very challenging.

3. METHOD

We adopted an exploratory approach to discover the factors that managers considered while adopting IBPS. An inductive approach was used to identify the factors. We collected qualitative

data using semi-structured interviews of managers of organizations that were considering or had adopted standardized interorganizational processes in their B2Bi. A qualitative approach with an exploratory stance offered several advantages pertinent to our study: (1) an opportunity to become immersed in the context of the research—implementation of standard interorganizational processes in B2Bi contexts (see Kaplan and Duchon, 1988); and (2) an ability to overcome the constraints imposed by existing theories, or lack of theories, given the nascent stage of research on the adoption of IBPS (see Eisenhardt, 1989; Yin, 2002).

3.1. Research Site

We collected data from the clients of an ICT solution provider that helps implement *RosettaNet*-based standards for interorganizational linkages. Founded in 1998, RosettaNet (www.rosettanet.org) is an industry consortium of major computer and consumer electronics, electronic components, semiconductor manufacturing, telecommunications, and logistics enterprises. RosettaNet was an appropriate setting for this study because it is one of the few industry consortia that develop industry-wide, open business process standards for supply-chain collaboration. Given that our purpose was to understand the factors that influence managerial decisions regarding IBPS adoption, studying organizations that had adopted or were considering RosettaNet adoption provided an appropriate context.

3.2. RosettaNet IBPS

RosettaNet's ultimate mission is to standardize and integrate business processes, not IOS, for interorganizational relationships (Bui, 2003). There are two functional areas through which RosettaNet aims to achieve its mission: (1) *Partner Interface Process (PIP)*; and (2) *RosettaNet message*. While a RosettaNet message is an integral part of the overall RosettaNet implementation that primarily deals with the technical specifications regarding data exchange and integration, here we focus on PIPs as they are the building blocks of RosettaNet IBPS. PIPs define business processes between trading partners by specifying the activities, decisions, and roles for each partner involved in a particular business activity (Bui, 2003; RosettaNet, 2005). RosettaNet PIPs are organized into seven *clusters*—or groups of core business processes—that represent the backbone of the trading network. Each cluster is broken down into *segments*—cross-enterprise processes involving more than one type of trading partner. Each segment contains individual PIPs. Each PIP includes a business document with the vocabulary and a business process with the choreography of the message dialog (RosettaNet, 2005).²

Figure 2 (next page) presents the RosettaNet implementation of a business process known as PIP 3A2—Request Price and Availability. This PIP

is part of *order management* cluster and *quote and order entry* segment (Segment 3A). In this integrated process, a buyer identifies potential supplier and sends a standard *price and availability request* for specific products. Upon receipt of the request, the supplier analyzes it and sends a standard response back to the buyer. The buyer takes appropriate action based on the supplier's response. While the process described here represents a simplified version of the actual business process, the PIP specification, a freely available document, describes the process in detail from technical and business perspectives.

3.3. Data Collection

We collected data from 56 organizations in different roles in supply chains.³ Our source company allowed us to interact with the organizations that had adopted or were considering IBPS. Given that RosettaNet offers process standards primarily for the high-tech industry, the organizations studied were primarily ICT organizations, but included logistics providers, distributors, and retailers of ICT products. Of the 56 organizations, 41 were considering adoption and 15 had already adopted some RosettaNet-based IBPS. Semi-structured interviews of managers who were actively involved in the process of adopting RosettaNet standards were conducted. A total of 73 middle managers (e.g., purchase manager, client manager), including ICT man-

2. A detailed of PIPs is available at the RosettaNet website (<http://www.rosettanet.org>).

3. A subset of this data was used in a related paper (Bala and Venkatesh, 2007) where we studied the assimilation of IBPS in 11 of these 56 firms.

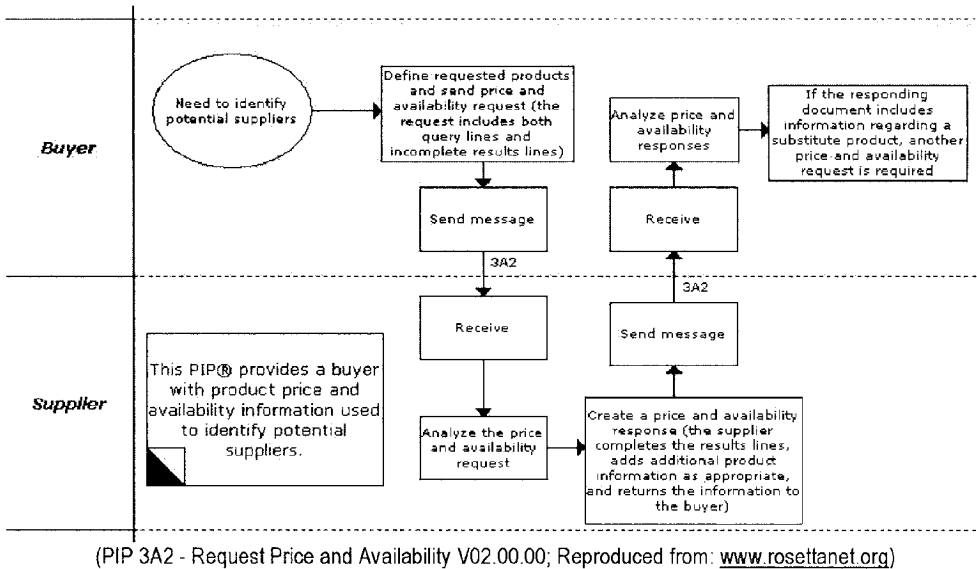


Figure 2: Example of a RosettaNet Standard Business Process.

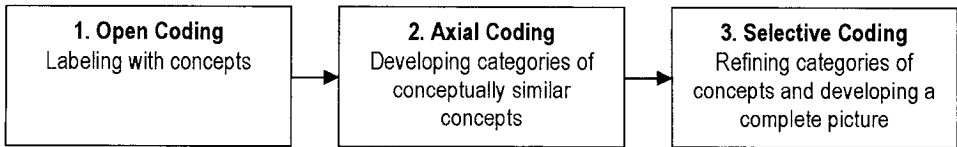
agers in large organizations (e.g., where the supply-side logistics unit had its own ICT staff), were interviewed.

We started with the following questions: *why do you think your organization should adopt [or not adopt] process standards for B2Bi, what factors do you [did you] consider in deciding in favor of or against process standards in B2Bi, and how do you plan to convince [how did you convince] the key stakeholders (e.g., top management, potential executors of the business processes, and ICT people) in favor of/against process standards for B2Bi?* Later questions were dictated by the responses to the above questions. Some organizations had adopted some IBPS for B2Bi, others were in the midst of the adoption process, and some others were still in the evaluation phase. We conducted interviews of the managers at multiple points in time, especially if they were in the midst of the implementation or if they decided to

adopt subsequent to the initial interviews. The entire interview and data collection process lasted 2 years.

3.4. Data Analysis

We analyzed the data using three coding procedures, as illustrated in Figure 3: *open, axial, and selective* (Strauss and Corbin, 1998). Open coding is the process of breaking down, comparing, conceptualizing, and categorizing the qualitative data from the interview transcripts (Boudreau and Robey, 2005). According to Strauss and Corbin (1998), the key step in open coding is to compare various incidents, events, quotes, and instances gathered during data collection in order to find similarities and dissimilarities. We compared the responses from the interviews to identify similar text segments. We coded these similar text segments into meaningful categories. One important



(Adapted from Beyer and Hannah 2002)

Figure 3: Procedure Used to Analyze the Interview Data.

aspect of open coding is differentiating between in vivo codes that are derived from the language and terminology used by participants, and scientific constructs that are derived from the researcher's scholarly knowledge and understanding of the disciplinary, literature-based field being studied (Strauss and Corbin, 1998).

Axial coding is used to further group the categories identified via the open coding. This grouping is primarily based on the conceptual similarities of the categories from the open coding, the codes and the text segments associated with the codes. The last coding scheme, selective coding, is the process of integrating and refining the theory (Strauss and Corbin, 1998). In selective coding, all the major categories identified in axial coding are finally integrated to form a *larger theoretical scheme*. One of the purposes of selective coding is to formulate a coherent story line from the findings (Boudreau and Robey, 2005). During axial and selective coding, we moved back and forth between theory and data and attempted to make connections among categories identified by open coding. We drew from prior theory and literature on IOS and technology adoption in organizations (e.g., Chwelos *et al.*, 2001; Fichman, 2000; Premkumar *et al.*, 1994; Teo *et al.*, 2003) in the process of identifying var-

ious categories and subcategories. Following the guidelines of Strauss and Corbin (1998), we continued the data analysis until the state of *theoretical saturation* which is the point at which diminishing returns are obtained from new data analysis or refinement of coding categories (Gasson, 2004; Strauss and Corbin, 1998). In our case, we stopped the analysis when no new categories were emerging and we were able to place new text segments into the existing codes and categories. We incorporated ideas, concepts, and theoretical perspectives from the literature to understand the patterns that emerged from the interviews. At the end of the selective coding, we developed a rich understanding of IBPS adoption from the perspective of managers.

4. RESULTS

In this section, we present the managers' perceptions on various factors that drove them to or away from adopting IBPS. We grouped the factors that we identified in our data analysis into three categories: *external*, *internal*, and *instrumental* factors. Given that respondents were free to make comments on various issues related to IBPS adoption, there was some overlap across the categories. The overlap suggests potential interrelationships among the categories.

4.1. External Factors

As advocates of the adoption of innovations, some managers proactively *scan* the organizational environment and *interpret* various external factors in order for them to justify their biases toward innovations and seek support from the key stakeholders—top management, employees, ICT department, and trading partners (Beath, 1991; Howell and Higgins, 1990a, 1990b). We found that the managers whom we interviewed were explicit in articulating both favorable and unfavorable external factors. We identified three key categories of external factors that seemed to play important roles in their decision to adopt or reject process standardization in B2Bi contexts: *institutional pressures*, *standards uncertainty*, and *quality of interorganizational relationships*. As shown in Table 1, each of these categories has a few subcategories that we identified from the text segments.

Institutional pressures represent the managerial perceptions of key external stakeholders' reactions towards process standardization, extent of adoption, and dominance in the environment. From a theoretical perspective, these categories are consistent with institutional theory that suggests that three types of institutional forces—i.e., *mimetic*, *normative*, and *coercive*—may influence organizations to adopt innovations (DiMaggio and Powell, 1983). In the context of interorganizational relationships, much prior research has suggested that external forces play a critical role in the adoption of ICT-based interorganizational linkages

(Chwelos *et al.*, 2001; Son *et al.*, 2005; Teo *et al.*, 2003). Consistent with prior research, we found that managers were aware of various institutional forces such as competitive pressure, the dominance of the trading partners, and the extent and success of adoption by the trading partners. These forces played a key role in the IBPS adoption decision made by the managers.

Standards uncertainty represents the managerial perceptions of whether the standards and associated technologies are stable over time and able to deliver the intended outcomes. As presented in Table 1, managers were concerned about the stability and capability of the IBPS developed by RosettaNet. The role of uncertainty (e.g., environmental uncertainty) has been underscored in both interorganizational relationships literature and ICT innovation diffusion literature as one of the key inhibitors of adoption (e.g., Fichman, 2000; Gosain *et al.*, 2004-5; Premkumar *et al.*, 2005). As a form of environmental variability (e.g., Sia *et al.*, 2004), standards uncertainty played a major role in forming managerial perceptions of process standardization and the subsequent adoption decision (cf. Duncan, 1972).

Quality of interorganizational relationships represents various factors that indicate the extent and depth of the relationship that managers think their organizations have with their trading partners. For successful interorganizational arrangements, relationships with trading partners and other external stakeholders is of paramount importance (e.g., Hoetker, 2005; Jap, 1999; Premkumar *et al.*, 2005). Strong

interorganizational relationships can reduce uncertainty and institutional pressures by improving trading partners' knowledge about each other's capabilities, developing a sense of shared meaning and/or common language, and by improving communication and coordination routines (Hoetker, 2005; Hult *et al.*, 2004). The managers we interviewed expressed concerns about the interorganizational relationships among the trading partners. Some of them explicitly pointed out that lack of trust, communication,

and coordination were reasons to not adopt RosettaNet IBPS.

4.2. Internal Factors

Internal factors represent a set of intraorganizational factors that managers believe can enable or inhibit organizational adoption of IBPS. Table 2 presents the categories and subcategories of internal factors. The most-frequently mentioned internal factor was internal pressures—managerial perceptions regarding key intraorganizational stakeholders' reactions towards the

Categories	Subcategories	Example Text Segments
Institutional pressures	<ul style="list-style-type: none"> • Trading partners' pressure • Dominance of partners • Partner dependency • Competitive pressure • Extent of adoption by competitors • Success of adoption by competitors • Trade or professional bodies influence 	<ul style="list-style-type: none"> • “[company] is so large and our largest buyer and they want us change our processes so they can clearly understand how we work.” • “If our processes are not standardized, our buyers may take their businesses to those companies that have standardized as it can make the ordering processes for customers more predictable.” • “My team is learning quickly about RosettaNet because our competitors seem light years ahead with standardized non-proprietary business processes.” • “Some very big name companies have studied and developed these business processes. We would be foolish not to take a very close look at these presumably optimal business processes and documentation and data requirements that go with the new processes.”
Standards uncertainty	<ul style="list-style-type: none"> • Lack of generally accepted standards • Stability/rate of change • Technology ability 	<ul style="list-style-type: none"> • “I don't think RosettaNet is set in stone—pardon the pun. I believe the processes will still evolve.” • “While RosettaNet may give us a leg up on electronic business exchange, I am not sure what that does to the vast number of paper-based business processes in our company and industry.”
Quality of inter-organizational relationships	<ul style="list-style-type: none"> • Length of relationship • Extent of communication, cooperation, and coordination • Trust • Knowledge of partners' capability 	<ul style="list-style-type: none"> • “We prefer to be well-coordinated with our suppliers and key buyers. None of them has turned to RosettaNet yet.” • “We work closely with three of our major buyers. We adopted RosettaNet processes because it made it easy for us to do business with them.” • “I simply cannot change our processes for any relationship we have. One day they [buyers] will dump our business or suppliers may jack up the prices and we are now stuck with some strange business process for no good reason.”

Table 1: External Factors.

implementation of IBPS in B2Bi contexts. The innovation diffusion literature suggests that the support of intraorganizational stakeholders—e.g. top management, employees, ICT department, etc.—is crucial for the successful adoption of organizational innovations (Bassellier *et al.*, 2003; Jarvenpaa and Ives, 1991; Sharma and Rai, 2003). Internal pressures can operate through compliance, identification, and internalization (see Kelman, 1958; Venkatesh and Davis, 2000). However, as shown in Table 2, compliance seems to be the dominating mechanism as most managers expressed that there existed significant pressure from top management or other stakeholders for adopting/not adopting RosettaNet IBPS.

Adoption of IBPS may result in changes to jobs, altered information flow, new and standardized documentation requirements, and often new software. The changes embedded in this particular technology can potentially enrich jobs, thus leading to positive employee reactions. Conversely, it may induce stress due to the negative consequences associated with technology-based job changes that cause routinization of jobs (Davenport, 2000) or relocation of power centers. Consistent with such a view, we found both positive and negative comments from the managers regarding the potential job changes.

Technology readiness represents managerial perceptions of whether an organization has the necessary technology infrastructure to implement IBPS. RosettaNet PIPs require XML-based architecture and several other key com-

ponents (e.g., RosettaNet Implementation Framework [RNIF] connections, trading partner profile/contract manager, execution management interface, etc.) in order for an organization to implement the PIPs (SYS-CON, 2005a, 2005b). The organizations need to have compatible technologies (e.g., interoperable ERP/CRM systems for private processes, and hardware infrastructures that support these systems). We found that the managers were concerned about whether the existing software applications were compatible with the XML-based IBPS. Another aspect of technology readiness is technology standardization (e.g., use of Internet, XML-based data formats, etc.) across all the trading partners. Prior research has also suggested that technology readiness or sophistication is an important determinant of the adoption of ICT-enabled interorganizational linkages (e.g., Chwelos *et al.*, 2001).

The managers were also concerned about the competence of the ICT professionals who manage and support B2Bi. While the IBPS are usually implemented by an ICT solution provider (e.g., our source company), the internal ICT department is typically responsible for day-to-day administration and support. Given the added complexity of supporting processes that are shared across two or more trading partners, the ICT department's ability to support complex interorganizational systems is vital for the successful adoption of such systems. As presented in Table 2, some managers were concerned that the internal ICT personnel were not competent enough to manage and

support the systems that enable shared IBPS.

Finally, favorable organizational culture is important for the adoption of innovations. Managers were concerned about various facets of their organiza-

tion's culture. Some perceived their organization was not receptive to innovation and others felt their organization actively opposed the adoption of IBPS. Like many other factors, we found that organizational culture played a dual role as an enabler and an inhibitor.

Categories	Subcategories	Example Text Segments
Internal pressures	<ul style="list-style-type: none"> • Management support • Corporate politics/power • Conformity with parent company's policy • Relationships with top management, ICT department, and potential users • Employee support 	<ul style="list-style-type: none"> • "Our top management team wanted us to do it. Plain and simple." • "I have wanted to do standardize processes for some time now. There just is no commitment to it. Our CEO often says that we don't need to do something that we don't need." • "I think we are committed to most Microsoft-led stuff. The process standards from RosettaNet are seen the same way."
Job change	<ul style="list-style-type: none"> • Enriched jobs • Reduced responsibilities • Routinization • Deskilling 	<ul style="list-style-type: none"> • "The changes could allow our employees to focus on interacting with people rather than pushing paper." • "It is sure to routinize some jobs and marginally improve others." • "It will change employees from being generalists to specialists but I like the idea that their roles will be well-defined." • "It is sure to make employees feel that the fun and versatility is being taken out of their jobs."
Technology readiness	<ul style="list-style-type: none"> • Technology infrastructure • Technology standards • Legacy systems 	<ul style="list-style-type: none"> • "If we adopt these process standards, our hardware infrastructure and software application base will collapse. We would need a major revamp." • "We have been preparing for process standardization with technology standardization for some years now."
ICT competence	<ul style="list-style-type: none"> • Skilled ICT professionals • Ability to support standard processes • ICT professionals' business knowledge 	<ul style="list-style-type: none"> • "I have no idea how our ICT group can support such business process standardization." • "Our biggest mistake was somehow misconstruing that business process standardization was also a type of technology standardization. Our ICT folks are at a loss."
Organizational culture	<ul style="list-style-type: none"> • Receptiveness to innovation • Risk-taking • Participative management practice • Resistance to change 	<ul style="list-style-type: none"> • "We prefer not to be at the forefront of adoption of technologies. This is a step worse—it is making a meta-decision about perhaps what technologies and applications we can adopt in the future." • "We prefer to hurry up and wait." • "We like to innovate but this innovation seems like a non-innovation in that we have made everything like everybody else. Where is the room for competitive advantage?"

Table 2: Internal Factors.

4.3. Instrumental Factors

The instrumental factors represent the managers' attitudinal beliefs regarding the potential benefits of IBPS in B2Bi. The technology adoption literature provides theoretical perspectives on individuals' perceptions of various instrumental benefits of new technology (e.g., Davis *et al.*, 1989; Karahanna *et al.*, 1999). In the context of B2Bi, the innovation diffusion theory (IDT; Rogers 1995) has been used extensively to identify and understand various instrumental beliefs regarding ICT-enabled interorganizational linkages (e.g., Chwelos *et al.*, 2001; Premkumar *et al.*, 1994). Instrumental factors were divided into three sub-categories—i.e., *perceived benefits*, *process compatibility*, and *complexity* (see Table 3).

Perceived benefits are conceptually similar to *relative advantage* (Rogers, 1995), *perceived usefulness* (Davis *et al.*, 1989) and *performance expectancy* (Venkatesh *et al.*, 2003) except that managers considered both individual and organizational benefits in assessing the potential benefits of IBPS. The responses in Table 3 suggest that while some managers were confident about the benefits of IBPS, others were skeptical. We also found that some managers questioned whether trading partners wanted them to adopt IBPS—a question of legitimacy.

Process compatibility represents managerial perceptions of whether the IBPS are compatible with the existing processes, routines, procedures, and technologies. Compatibility is an important driver of innovation diffusion (Rogers,

1995). In the context of process standardization, compatibility is critical because if the standard processes are not compatible with the existing processes and technologies, the adoption of such standards may lead to negative outcomes. Prior research on process changes has also underscored the importance of compatibility (e.g., process-technology compatibility). Managers were aware of the potential incompatibility between the RosettaNet processes and the internal private processes. They were concerned about possible negative implications of adopting RosettaNet IBPS.

Complexity refers to how effortlessly organizations can manage the change processes associated with process standardization and integration. Business process changes are complex and require careful planning and meticulous execution (e.g., Davenport, 1993; Grover *et al.*, 1995). Some managers were aware of the potential complexity. While some managers noted that much of the implementation complexity would be managed by the solution providers, they were concerned about the potential complexities in the post-implementation phases (e.g., learning, integration with private processes).

5. DISCUSSION

Recently, it has been suggested that IBPS can help organizations strengthen interorganizational relationships and thereby, improve operational efficiency, customer satisfaction, competitive advantage, and knowledge creation (Cappgemini, 2004; Gosain *et al.*, 2003,

Categories	Subcategories	Example Text Segments
Perceived benefits	<ul style="list-style-type: none"> • Profitability • Customer satisfaction • Economies of scale • Productivity • Efficiency • Legitimacy 	<ul style="list-style-type: none"> • "I think it will create a tremendous impact on bottom line in the long run." • "These processes are not where the empire is built. These are not core business processes—I don't believe the pennies we save are going to do much for our profits." • "I think it can impact customer sat because we can streamline the handling of customer issues."
Process compatibility	<ul style="list-style-type: none"> • Process–Technology compatibility • Compatibility between standard processes and internal processes • Paper-based processes • EDI-based processes • Coupling of private and public processes 	<ul style="list-style-type: none"> • "We have taken baby steps. We have tried to implement some of the standard processes on the inside by standardizing processes related to the ICT department or other such cost centers in the hopes that we will learn from it for our partner processes." • "Our processes can never be altered. We have far too many paper-based processes. We will have to shut down for a year just to figure it all out." • "I think standardizing is causing us to lose out on some of the best features of our own process innovations even in the area of commonplace business processes."
Complexity	<ul style="list-style-type: none"> • Ease of implementation • Ease of use • Ease of learning the changed processes 	<ul style="list-style-type: none"> • "This will take years of change management support." • "There are best practices and the RosettaNet giants should be able to help us—I think some business processes can be standardized easily."

Table 3: Instrumental Factors.

2004-5; Ogden *et al.*, 2005). However, notwithstanding the general recognition of the importance of IBPS in the context of B2Bi, little or no research has been conducted on the adoption of IBPS in B2Bi contexts. Our study attempts to fill this gap by identifying factors that influence the adoption of IBPS in B2Bi. Figure 4 presents a summary of our major findings. The figure shows that three set of factors are important drivers of IBPS adoption. While some of the factors shown in the figure have been identified in much prior research as determinants of IOS adoption, several factors emerged in this study (e.g., process compatibility, job change, standards uncertainty) that are pertinent to IBPS adoption con-

texts. In this section, we discuss the theoretical and practical implications of our findings along with the limitations and future research directions.

5.1. Contributions and Implications

A major substantive contribution of our study is the inductive identification of factors that managers perceive as being drivers of the adoption of IBPS in B2Bi. The extension to the body of knowledge on the adoption and diffusion of standards is noteworthy. Also, the insights gained from the study reported here further our understanding of integration, particularly process integration (e.g., Rai *et al.*, 2006). By focusing on the broader idea of interorganizational

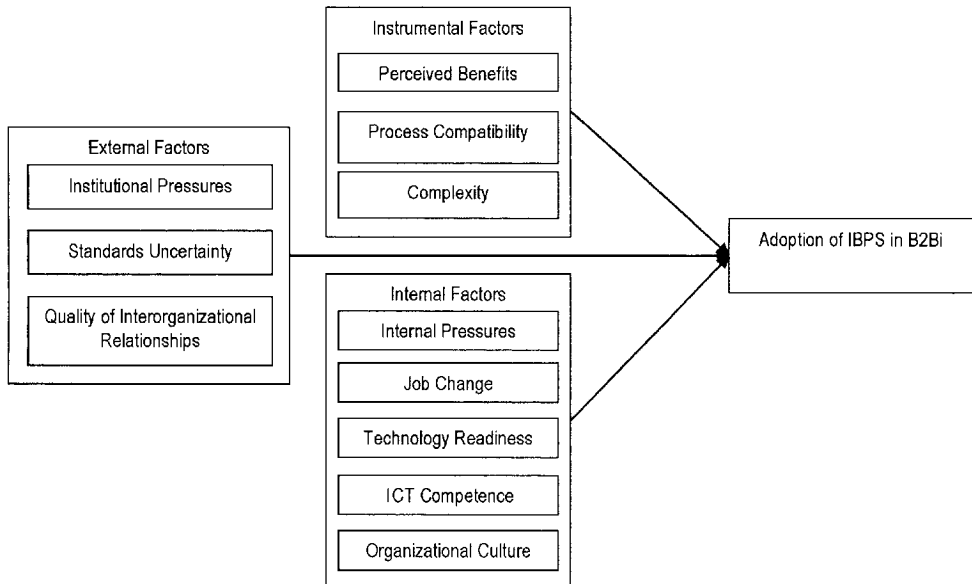


Figure 4: A Model of IBPS Adoption in B2Bi.

relationships through process standardization, we deepen our understanding of collaboration across trading partners. While the focus of this study was not to understand the *outcomes* of IBPS adoption and our findings do not directly shed light on how IBPS may improve collaboration across trading partners, we suggest that adoption of IBPS will help improve interorganizational collaboration by making interorganizational processes more predictable and efficient and reducing variations among trading partners. Given that these are open standards and do not require relationship-specific investments, organizations may implement these standards as a safeguarding mechanism against opportunistic behavior (Williamson, 1995), thus will be more willing to enhance existing collaborations. The factors identified here are more comprehensive relative to prior research. The factors contributing to the adoption of IBPS in B2Bi present an

important step in our understanding of this emergent phenomenon and provide opportunities for extensive future research.

Our study has implications for the interorganizational relationships literature in at least two ways. First, we identified key factors by interviewing managers who promote the adoption and implementation of IBPS in organizations. Even though some of the factors that we identified overlapped with factors in the current literature, we discussed various theoretical explanations for the relationships among the factors. We found that managers considered wide variety of factors while they were considering adoption of IBPS. Second, much prior research on IOS adoption has focused on either rationalistic approaches (e.g., transaction cost economics theory) or macro-level theories (e.g., institutional theory). However,

our results indicate that other theoretical mechanisms—e.g., the relational view of the firm and organizational inertia theory—can be used to explain managers' perceptions toward process standardization. Using the knowledge gained in this paper, in our related work (Bala and Venkatesh, 2007), we employ three different theoretical mechanisms—i.e., the relational view of the firm, institutional theory, and organizational inertia theory—to study the assimilation of IBPS at dominant and non-dominant organizations.

The managers were quite *mindful* in their reactions toward process standardization. They were concerned about the dual roles of various factors. Certain factors were acting as a catalyst, in some organizations, and an inhibitor in other organizations. Thus, IBPS adoption is different from technology adoption in general, as process changes depending on the radicality of the changes may have dramatic impacts on individual and organizational performance and other key outcomes. In general, we found managers to be mindful in promoting process standardization as they understood the ramifications of process changes. Specifically, they were more context-sensitive and not driven by institutional preemption (e.g., Swanson and Ramiller, 2004).

These findings have important implications for organizations. Clearly, the need to consider a broader range of factors than previously studied in standardization or integration research is underscored based on our findings. Many factors can act as catalysts or inhibitors. This requires managers to

be more mindful as they manage the organizational environment during the implementation of process standardization across trading partners. While ERP implementations within organizations often come with process changes and job changes, the changes when implementing IBPS in B2Bi will be even more substantial, thus calling for greater caution in ensuring that employee morale is effectively managed during times of such dramatic change. The ICT department within the organization has to deal not only with the technological integration within and outside the organization, but also with new business processes that are designed externally and may not be compatible with existing processes.

The importance of the strength of ties with the trading partner points to important issues that merit the attention of managers. In a sense, this presents a “chicken and egg” situation. On the one hand, process standardization across trading partners can lead to deeper collaboration. On the other hand, deep collaboration is a necessary condition for successful process standardization across partners. Partners need to build trust and have open channels of communication before attempting to standardize interorganizational business processes. Finally, a practical challenge is that organizations typically have different trading partners and it is possible that different dominant trading partners may have different standards that are likely to be incompatible. Firm dominance is an important issue in interorganizational relationships and prior research has suggested that firm

dominance played important role in the adoption and use of IOS (see Hart and Saunders, 1997; Riggins *et al.*, 1994). The role of firm dominance in the context of IBPS adoption has been examined in our related work (Bala and Venkatesh, 2007) where we found that dominant firms exert significant influence over their non-dominant counterparts to implement IBPS. In order to maintain relationships with important trading partners, it is possible that non-dominant partners will implement a certain set of IBPS and thereby, alienate some trading partners who may not implement the same IBPS. While an important issue for organizational consideration, this issue also merits further research to learn how organizations are approaching this challenge presently and what potential strategies may be to best manage the issue.

5.2. Future Research Agenda

There are several important and potentially fruitful next steps in this research stream that will help further our understanding of IBPS in B2Bi and not only the adoption of such process standards by organizations but also the garnering of positive outcomes from such an adoption. We organize the research agenda into five important areas, which while not exhaustive are meant to be representative: (1) various situational and contextual factors that can help understand some of the paradoxical findings (e.g., same factors play the role of a catalyst or an inhibitor); (2) generalizability of our findings; (3) various interventions, best practices, and lessons that can help successful imple-

mentation of process standards; (4) validation of our findings across various key stakeholders—top management, ICT department, and employees; and (5) studies to understand how organizations that operate globally integrate standard business processes with their international trading partners.

There are several situational factors that merit consideration in future work. It is possible that situational characteristics will result in certain factors playing a more significant role. Potential contingencies include firm size, product type, industry type, market characteristics, etc. Also, it is interesting to note that the same factor can serve as a catalyst and an inhibitor—this could potentially be due to contingencies such as organizational culture, the degree of compatibility between public and private processes, and managerial ability to scan and interpret external environment. The need to investigate contingencies is underscored by the findings: why do some factors play a role of catalyst in some organizations while play a role of inhibitor in some other organizations? Case studies present one of the most likely ways in which further richness and actionable knowledge can be gained.

The generalizability of these findings to other industries is an important future research direction. Given that the RosettaNet standard is primarily being considered and used in the high-tech industry, other standards merit study. In addition, it is possible that organizations will be influenced by different set of factors given the degree of idiosyncrasy of their organizational cul-

ture. The next step beyond generalizability is a further validation of the factors identified here. We conducted interviews of a small number of managers only. Other important stakeholders such as top management, various members of the ICT department, and employees should also be queried. Such studies could help expand the set of factors beyond what we have found here and deepen our understanding of the phenomenon. We did not compare the findings across organizations that play different roles in the supply chain (e.g., manufacturer, distributor, and retailer) and such differences are worth studying.

The range of factors identified here present opportunities to begin the study of interventions that could lead to greater adoption. The challenges associated with implementing IBPS in B2Bi were underscored in this work. Researchers need to take the next step of examining what interventions—e.g., change management practices, training and education of employees in partner organizations, other types of managerial interventions—will create the expected benefits. Future research via case studies can identify best practices and lessons learned that can shed light on feasible interventions.

6. CONCLUSIONS

We found various external, internal, and instrumental factors played the role of catalysts and inhibitors of the adoption of IBPS in B2Bi. There were a broader range of factors that were found to be relevant when compared to what

was found in prior research on the adoption of technology standards or process integration. While there are expectations of substantial benefits of deep collaboration, the challenges are also very significant. Our work provides insights into several factors that managers should consider, be mindful of, and proactively manage as they embark on process standardization efforts in B2Bi. Although research on business processes and standardization is rich, there is limited research on IBPS in B2Bi. Building on our findings, we presented potential directions for further study, including a call for research related to generalizability, situational considerations, interventions, and globalization.

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