Information technology and organizational performance within international business to business relationships

A review and an integrated conceptual framework

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Abstract

Purpose – Advanced information technology (IT) changes the way companies manage cross-border supply chains. This paper examines the role of IT in the context of international business to business (B2B) relationship and its contribution to supply chain performance.

Design/methodology/approach – This literature review paper develops a conceptual model of IT-mediated relationships in international supply chain relationships. The framework integrates transaction cost economics and resource-based theory perspectives and argues that IT capabilities facilitate supply chain performance, deter partner's opportunism and this process is mediated by B2B processes. Moreover, environmental, relational, cultural and country level moderators are examined.

Findings – It is suggested that IT capabilities contribute directly to improved organizational process such as coordination, transaction specific investment, absorptive capacity and monitoring. These in turn contribute to strategic and operational performance outcomes. Against a resource-based as well as a transaction-cost theory background it is suggested that partner interdependence and environmental, country and cultural factors moderate the process of IT contribution on performance.

Research limitations/implications – The paper provides a number of propositions which can be tested empirically in future studies.

Practical implications – Managers should focus on the complementarities of IT capabilities. Electronic integration in combination with, for example, human IT resources may enhance supply chain performance and mitigate the moderating effects of environmental, relational, cultural and country factors.

Originality/value – The paper develops an integrated conceptual model and propositions which contribute to a clarification of the ambiguous nature of the IT-business value in international B2B relationship.

Keywords Communication technologies, International business, Channel relationships, Organizational performance

Paper type Literature review

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1. Introduction and motivation

Globalization forces are changing the way we do business. Companies increasingly focus on their core capabilities and the trend toward outsourcing has grown (Doh, 2005; Espino-Rodriguez and Padron-Robaina, 2006; Mol *et al.*, 2005). Relationship management has been regarded as a key factor in a successful outsourcing arrangement (Tompkins *et al.*, 2006). It has been argued that information technology (IT) plays a crucial role in managing interorganizational B2B relationships, most importantly among supply chain members across borders (Wang *et al.*, 2006). For example, Dell computer successfully employs IT in its global operations by means of a virtually integrated value chain with customers, distributors and suppliers. Dell harvests production efficiencies such as improved speed and flexibility in the global IT industry (Joan, 1998).

However, despite some promising and optimistic views of the contribution of IT on business value, there has been a long debate on the impact of IT on organizational performance, which is called the "IT productivity paradox" (Brynjolfsson, 1993). This paradox points out that IT does not necessarily enhance productivity or business performance; in fact, IT may even be viewed as a commodity which can easily be replicated by competitors (Carr, 2003), and hence diminishes the prospects to develop sustainable competitive advantage. As far as the B2B context is concerned, a link between how IT affects specific organizational processes and outcomes in buyer-supplier relationships and supply chain performance (Bharadwaj, 2000) has yet to be established. Additionally, in terms of the international context which we want to address in this paper, there is a very specific call for more research on the impact of IT on international supply chain management (Nakata and Huang, 2005). Filling the gap in the literature, this study is exploring the critical research question, whether and how IT impacts on firm performance in the context of international supply chain relationships, a specific type of B2B relationship (Samiee and Walters, 2006).

To this end, the purpose of this paper is to review and integrate various perspectives and theoretical bases on the impact of IT on supply chain relationship and performance. We link transaction cost economics (TCE) and resource-based theory to develop a comprehensive conceptual framework of IT in managing international supply chain relationship and enhancing business performance. This framework is presented as a tool for further investigations into international B2B relationships. Furthermore, we develop propositions for future empirical testing. Finally, implications of the study for future research and managerial practice are discussed.

2. An overview of the IT-mediated supply chain relationship and performance literature

In recent years, there has been increasing amount of research on the impact of IT on supply chain relationship and performance. This issue has been discussed using numerous perspectives in marketing (Kim *et al.*, 2006), supply chain (Sanders, 2005), information systems (IS) (Rai *et al.*, 2006) and strategy literatures (Kim and Mahoney, 2006). However, empirical evidence on the issue is still fragmented and a comprehensive conceptual framework to integrate different theoretical perspective is lacking in the literature.

For instance, the extant literature has widely discussed the use of Electronic Data Interchange (EDI) as a traditional interorganizational IS that mediates buyer-supplier transactions (Chatfield and Yetton, 2000; Vijayasarathy and Robey, 1997). EDI is, e.g. suggested to realize economic value such as reduced costs of carrying inventory, obsolescence and transportation through more accurate and timely information exchange in the automotive industry (Chatfield and Yetton, 2000; Mukhopadhyay and Kekre, 2002). However, EDI is not always directly and positively related to value creation in the supply chain context (Benjamin *et al.*, 1990; Naude *et al.*, 2000) and what is more, the proliferation of EDI is relatively narrow and typically limited to large companies, as these systems are highly complex and require a high level of customization (Zhu *et al.*, 2006). With the coming of the internet age, many firms are using the internet to do business in their supply chain (Lancioni *et al.*, 2000). The internet has enhanced traditional EDI systems by making them more flexible and lowering transaction costs (Garcia-Dastugue and Lambert, 2003; Zhu *et al.*, 2006). Thus, more companies have gone beyond the confines of traditional EDI and adopted more internet-based interorganization-IS such as eXtensible Markup Language (XML) in conducting their supply chain activities (Zhu *et al.*, 2006), although the benefit of these emergent technologies is also rather scant and relies mostly on case studies and anecdotal evidence (Garcia-Dastugue and Lambert, 2003; Lancioni *et al.*, 2003). Overby and Min (2001) suggest that the internet enhances the relationship between network orientation and international supply chain management but a review of the literature shows mixed results regarding the performance outcome of IT use in supply chain management, both in the context of traditional EDI application and the internet (Devaraj *et al.*, 2007; Kim *et al.*, 2006). Overall, some major factors should be identified to resolve the current ambiguity and lack of consensus in the literature.

Firstly, regarding the dimensions of IT adoptions and IT capabilities in the supply chain relationship and performance literature, there is still no consensus. Researchers use different terminologies, in the traditional EDI context, and EDI use measurements such as EDI volume, breath, diversity, depth, embeddedness have been examined for their contributions toward enhanced performance (Massetti and Zmud, 1996; Mukhopadhyay *et al.*, 1995). Recent studies in the IS and marketing literature, driven by the RBV, have discussed different IT resources and capabilities and their performance impact. As shown in Table I, for example, some researchers have adopted electronic or virtual integration as a key IT resource. Kim *et al.* (2006), for example, conceptualize applied technological innovation, administrative innovation and interfirm systems integration as three key IT resources in B2B settings.

Studies and authors	IT-related resources and capabilities
Wang *et al.* (2006), Kim and Umanath (2005), Kim and Mahoney (2006), Kim *et al.* (2006), Jean (2007)	Electronic integration
Rai *et al.* (2006)	IT infrastructure integration
Sanders (2005) and Wu *et al.* (2006)	IT alignment
Kim, K.K. *et al.* (2005)	Electronic coordination, electronic monitoring
Kim, D. *et al.* (2005), Kim *et al.* (2006) and Wu *et al.* (2006)	IT advancement

Table I.
Recent studies on key IT capabilities in the B2B context

Similarly, Arun *et al.* (2006) defined IT integration capability as a key IT resource which impacts on supply chain process integration and firm performance. One general conclusion from this is that IT integration capability has been a key dimension in most research. Some related concepts are IT alignment, and virtual or electronic integration.

Another debate on IT-mediated supply chain relationship and performance research centers around the direct or indirect link argument between IT and performance. In order to understand how IT improves business performance we use the emergent process-oriented approach (Pavlou and Sawy, 2006; Ray *et al.*, 2005). This argues that IT improves business performance through enhanced specific business processes, capabilities or structures. Most of this research is driven by the application of the RBV in IT-business value research (Melville *et al.*, 2004; Wade and Hulland, 2004), which contends that IT *per se* cannot directly link to enhanced business performance unless IT enhances or interacts with certain higher order organizational capabilities or business processes. Table II shows key links between IT-business performance in the supply chain context have been explored in recent studies.

For example, Subramani (2004) proposes and tests a model which examines supplier benefits from IT in supply chain relationships. His research shows that firms' relationship-specific investments play a crucial mediating role between patterns of IT appropriations and firm operational and strategic performance. Moreover, supply chain integration and dimensions such as coordination and collaboration have also been treated as important business processes which may mediate the impact of IT on supply chain performance. Recently, some studies in IS research have attempted to explore the impact of IT on organizational learning processes and performance in the supply chain context (Ettlie and Pavlou, 2006; Malhotra *et al.*, 2005; Pavlou and Sawy, 2006). Building on an absorptive capacity perspective, Malhotra *et al.* (2005) develop a conceptual model which demonstrates how interorganizational IS complement some interorganizational processes, enhance absorptive capacity in supply chain relationships and increase firm operational efficiency and creation of market knowledge.

Table II.
Recent studies on key business process which mediate IT-business value in supply chain contexts

Studies and authors	Mediators in IT-B2B business value
Rai *et al.* (2006)	Supply chain process integration including information flow, physical flow\, financial flow integration
Kim *et al.* (2006)	Information exchange, coordination and responsiveness
Gallivan and Depledge (2003)	Control and trust
Sanders (2005) and Vickery *et al.* (2003)	Supply chain Integration
Wang *et al.* (2006)	Manufacturer flexibility and supplier responsiveness
Malhotra *et al.* (2005)	Absorative capability
Kim, K.K. *et al.* (2005)	Firm coordination, partner coordination
Sanders (2007)	Operational coordination, strategic coordination
Bensaou (1997), Myhr and Spekman (2005) and Sanders (2008)	Cooperation (collaboration)

3. An integrated conceptual framework of IT on organizational performance in international supply chain

Different theoretical approaches have been applied in IT-mediated supply chain relationship and value creation research. Transaction cost theory (TCE) (Williamson, 1975) has dominated the IS literature and recently, researchers have embraced the RBV to examine IT and business value (Kim *et al.*, 2006; Rai *et al.*, 2006; Wu *et al.*, 2006) in the supply chain context. In the literature, many studies have applied TCE to discuss how advancement of IT changes interfirm governance structures. For example, Malone *et al.* (1987) examine IT on coordination costs in terms of searching and communicating with transacting parties. Gurbaxani and Whang (1991) and Clemons *et al.* (1993) both propose that IT reduces transactions such as the contractual hazards of shirking and opportunism through improved monitoring and reduced specificity in coordination. Subramani (2004) suggests that IT investments enhance firm competitive advantage, although overall there is a limited number of studies that explore IT-business value empirically. This is in line with Rindfleisch and Heide's (1997) view that "the limited research on TCE's performance implication makes it difficult to assess fully its theoretical value and empirical validity".

The RBV, rooted in the management strategy literature, has been applied to the study of IT-business value research (Wade and Hulland, 2004). Most of RBV-based studies try to define and classify various IT related resources and examine their impacts on business performance. For example, in an influential study, Bharadwaj (2000, p. 171) defines IT capabilities as "the ability to mobilize and deploy IT-based resources in combination or copresent with other resources and capabilities". He classifies three types of IT-capabilities:

(1) IT infrastructure.

(2) Human IT resources.

(3) IT-enabled intangible resources.

However, despite the conceptual appeal to link different resource attributes to competitive advantage, some ambiguities and confusions still exist with the application of RBV to business-value research. First, the conceptualization of IT resources is inconclusive, leading researchers to conceptualize and use different terms for IT resources or capabilities terms. Secondly, various business processes and capabilities which interact with IT capabilities in the process of value creation have also been discussed. Thirdly, it is still not very clear how different IT resources interact with other capabilities and business processes to create competitive advantage.

Thus, we integrate different streams of theories and build a conceptual framework. The framework depicts how IT capabilities enhance business performance in international buyer-supplier relationships. This context, a specific form of international business to business (B2B) relationships (Samiee and Walters, 2006) has been given limited attention in prior research (Bello *et al.*, 2004; Overby and Min, 2001). We develop the framework from the buyers' perspective, exploring electronic channel interactions with their key suppliers. Moreover, as to the context of the IT application in supply chain, we mainly support the electronic hierarchy hypothesis and focus on the function of IT supported interorganizational interaction in the international supply chain. We draw on Kim *et al.*'s (2006) supply chain communication system as the main domain of the present study, which is defined as

an IS that is involved in a firm's interaction with channel partners in order to carry out electronic transaction, quality and cost calibration, and collaborative forecasting and planning.

As shown in Figure 1, the proposed conceptual framework is rooted in the emergent stream of RBV in IT-business value research and complemented by TCE, as discussed in the previous section. According to the RBV, we argue that firms with specific IT capabilities which are rare, valuable and not easily substitutable can enhance specific cross-border interorganizational capabilities and processes. Additionally, drawing from TCE, we argue that these IT capabilities could serve as governance enabler (Chatterjee *et al.*, 2006) and thus allow better cross-border interorganizational governance structures for the firms. This view parallels Mayer and Salomon's (2006) contention that specific firm capabilities can improve a firm's ability to govern interfirm market transactions. In turn, these processes and governance structures lead to higher operational and strategic performance. Moreover, through effective governance structures, IT capabilities can also help firms to deter opportunistic behaviors in their international exchange relationships with their suppliers.

We focus on IT capabilities which can effectively and efficiently reinforce international interorganizational processes and restructure exchange relationships (Bharadwaj, 2000), electronic integration, human IT resources and complementary organizational resources. These are in line with Bharadwaj (2000)'s classification of IT capabilities which incorporate IT infrastructures, human IT resources and IT-enabled intangibles.

With regard to business processes and structures dimensions which mediate the effect of IT capabilities on international supply chain performance, we focus on

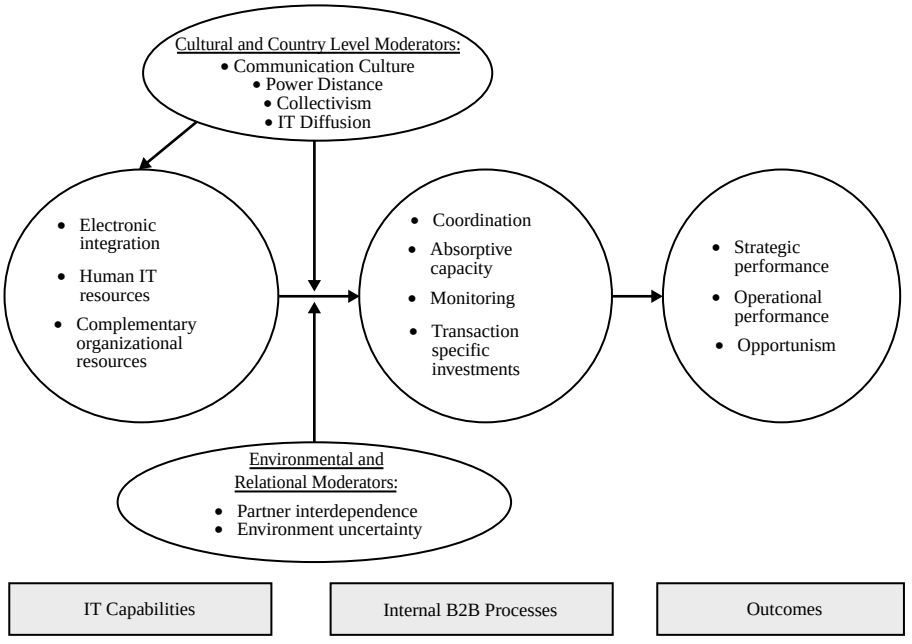

Figure 1.
An integrated conceptual framework of the effect of IT capabilities on international supply chain performance

coordination, absorptive capabilities, monitoring and transactional specific investments. Theses have been discussed in the literature as important process and structure mediators of IT impact on firm performance (Kim *et al.*, 2006). According to the RBV perspective, coordination and absorptive capabilities are interorganizational channel capabilities. Monitoring and transactional specific investments are drawn from TCE theory.

Operational and strategic performance has been widely treated as supply chain performance metrics in prior studies (Sanders, 2007; Subramani, 2004). In addition to these outcome dimensions, we include opportunism as a behavior performance variable in our model. Originated from TCE stream of research, there are a growing number of studies in the marketing literature that view opportunism as an interorganizational governance outcome, both in domestic (Wathne and Heide, 2000) and international channel (Cavusgil *et al.*, 2004) context.

3.1 IT capability dimensions

3.1.1 Electronic integration. As shown in our review, electronic integration has been treated as a crucial IT resource in the B2B context. According to Wang *et al.* (2006), electronic integration refers to the extent to which supply chain relevant activities between and within channel members are carried out by interorganizational IS. Electronic integration can cover a wide range of interfirm channel activities from loose transaction activities to tightly coupled ERP-to-ERP connections to facilitate collaborative demand planning and fulfillment (Chatterjee *et al.*, 2006) and thus can demonstrate varying results on business process and structures in the international supply chain exchange relationship. This perspective is also mirrored by Overby and Min (2001), who contend that depending on the levels and patterns of electronic integration, we will witness more or less significant impacts on business process and structures in the international supply chain relationship. They point at an array of I-commerce models which may range from the most simple information, interaction, and transaction, to the most sophisticated integration level.

From the RBV standpoint, it has been argued that electronic integration is an outside-in resource (Day, 1994) which can generate better firm performance than other inside-out IT resources such as advanced infrastructure (Wade and Hulland, 2004). Some studies have provided empirical evidence that electronic integration enhances channel capabilities such as coordination and information sharing (Kim *et al.*, 2006; Wu *et al.*, 2006).

From a TCE perspective, electronic integration can also be seen as an alternative form of governance structure which reduces transaction cost and provides desired levels of control and flexibility without ownership (Kim and Mahoney, 2006; Wang *et al.*, 2006; Zaheer and Venkatraman, 1994). Kim and Mahoney (2006) claim that electronic integration can act as mutual sunk-cost commitments to support exchanges between partners and thus can substitute for managerial hierarchy. Thus, we argue that electronic integration can be treated as a key IT resource which bridges both TCE and RBV standpoints.

In all, we identify that electronic integration is one of the most important IT capabilities in the international B2B context. Firms are likely to achieve effective and desired levels of international channel coordination and control through superior levels

of electronic integration with their foreign partners such as foreign distributors and suppliers.

3.1.2 Human IT resources. Technology is not likely to operate in a vacuum. Advanced IT needs to be managed and leveraged by sufficient and competent technical skills and knowledge. Human IT resources including technical skills and managerial skills have been regarded as important IT capabilities in prior studies (Bharadwaj, 2000). Technical IT resources refer to programming, systems analysis and design, etc. Managerial skills refer to collaboration with business units, project management and leadership skills.

From a RBV perspective, some studies have showed that human IT resources are rare and difficult to acquire and thus could be a source of a firm's competitive advantage. For example, in an empirical study in the supply chain context, Kim *et al.* (2006) find that the accumulation of internal IT skills and knowledge in the firm is an administrative innovation which enhance interfirm coordination and information exchange directly.

Thus, we identify human IT resources as key IT capabilities which can help firms successfully manage their global supply chain activities and achieve greater business value.

3.1.3 Complementary organizational resources. Complementary organizational resources refer to organizational resources which are complementary IT infrastructures (Melville *et al.*, 2004). Some complementary organizational resources have been considered in prior literature. For example, Bharadwaj (2000) describes customer orientation, knowledge assets and synergy as three IT-enabled intangibles. In their empirical study in the retail industry, Powell and Dent-Micallef (1997) find that firms can gain advantages by using IT to leverage complementary human and business resources such as flexible culture, strategic planning/IT integration and supplier relationships. Recently, Debabroto *et al.* (2006) identify some guidelines for advanced electronic partnering capabilities which include IT and business strategy congruency, relational campaign, organizational design campaign and technology architecture campaign.

In this conceptual paper, we focus on some institutional arrangements as complementary organizational resources which are needed to support supply chain innovations such as electronic integration in international channel settings. In building global electronic links in order to coordinate their geographically dispersed value chains and support global customers, global firms face greater challenges and difficulties from the institutional environment and culture constraints (Bello *et al.*, 2004; Kraemer *et al.*, 2006). Thus, some institutional arrangements such as contracting, ownership and social elements are required to support IT adoption in international supply chain activities (Bello *et al.*, 2004). Hence, we argue that institutional arrangements are important complementary organizational resources which could support electronic integration to gain benefits for firms in international B2B exchange. We further contend that with greater institutional arrangements serving as complementary IT resources, greater IT capability will increase business process and structure dimensions in international supply chain.

3.2 Outcome dimensions

3.2.1 Operational performance. Extant studies have examined the impact of IT in B2B context on different operational performance dimensions such as inventory cost

(Mukhopadhyay *et al.*, 1995), cycle time (Iyer *et al.*, 2004), and manufacturer flexibility (Wang *et al.*, 2006). It has been argued that IT capabilities can help firms reduce transaction and production cost and achieve operational efficiency.

3.2.2 Strategic performance. In addition to operational performance, the impact of IT on intangible, non-financial strategic performance has been paid more and increasing attention in recent studies. Strategic performance such as market performance (Kim *et al.*, 2006), new product development (Rai *et al.*, 2006), competitive advantage (Subramani, 2004), partner flexibility, relationship quality (Sriram and Stump, 2004), customer satisfaction (Rai *et al.*, 2006), and knowledge creation (Malhotra *et al.*, 2005) has been noted in the literature.

3.2.3 Opportunism. According to TCE, opportunism is defined as "self-interest seeking with guile" (Williamson, 1985, p. 47). Opportunism is a relational risk and refers to "incomplete or distorted disclosure of information, especially to calculated efforts to mislead, distort, disguise, obfuscate or otherwise confuse" (Williamson, 1985, p. 47). Recent studies have begun to investigate opportunism as a relationship outcome dimension and explicitly examined how different governance mechanisms can offset the extent of opportunism in the exchange relationship (Rokkan *et al.*, 2003). In the international channel context, Cavusgil *et al.* (2004) claim that the effective management of foreign partners opportunism is a central task for global firms.

It has been argued that IT application in B2B context can foster firm monitoring ability and balance information asymmetry between exchange members and thus can curb relational risk such as partner opportunistic behaviors (Chatterjee *et al.*, 2006; Gallivan and Depledge, 2003). Moreover, empirical evidence also points at advanced IT technology in B2B such as XML systems that can help companies achieve more flexible partner relationships and thus reduce relational risk (Gosain *et al.*, 2004). Thus:

P1. IT capabilities, including electronic integration, human IT resources and complimentary organizational resources, reduce partner opportunism and improve operational and strategic performance.

3.3 Business process and structure dimensions

3.3.1 Coordination. Coordination has been considered a crucial channel capability in previous studies (Jap, 1999; Karunaratna and Johnson, 1997). In the international context, studies establish that coordination is one of the capabilities in global account management which helps suppliers leverage their strategic resources to serve their global accounts on a worldwide base (Shi *et al.*, 2005). Buvik and John (2000) note that vertical coordination refers to information sharing and joint actions. Channel members can gain mutual benefits such as cost reduction and product development in exchange relationship through dyadic coordination activities (Jap, 1999).

As noted previously, several empirical studies have argued that advanced IT can reduce coordination cost through better information exchange quality and thus can enhance channel coordination capability (Kim, D. *et al.*, 2005; Wu *et al.*, 2006). Overby and Min (2001) also show that the more integrated the I-commerce model adopted by the firm, the more relational-oriented channel activities such as process integration and cooperation would appear in the international supply chain relationship. Thus, coordination is viewed as one of the business processes dimensions in IT-mediated international supply chain relationship.

3.3.2 Absorptive capacity. Absorptive capacity is conceptualized as a dynamic capability pertaining to knowledge creation and utilization that enhance a firm's ability to gain and sustain competitive advantage (Zahra and George, 2002). Initially developed in internal organization context, the notion of absorptive capacity has been extended to interorganizational levels and supply chain contexts by some researchers (Dyer and Singh, 1998; Ettlie and Pavlou, 2006; Malhotra *et al.*, 2005). According to Malhotra *et al.* (2005), absorptive capacity in the supply chain refers to the capability in which firms acquire, assimilate, transform and exploit information resources between channel parties. It has been argued that firms with greater absorptive capacity can enhance inter-firm knowledge sharing and operational efficiency, enabling market knowledge creation in the supply chain relationship (Malhotra *et al.*, 2005).

Furthermore, several researchers have pointed out that absorptive capacity is an IT-driven capability (Ettlie and Pavlou, 2006; Malhotra *et al.*, 2005). Superior IT capabilities can facilitate information acquisition and assimilation, and thus increase firm's absorptive capacity. Thus, we identify absorptive capacity as an IT-driven interorganizational capability in the conceptual framework.

3.3.3 Monitoring. According to TCE, monitoring has been regarded as one of firm's governance mechanisms which may suppress partners' opportunistic behavior via reduced information asymmetry (Stump and Heide, 1996). Monitoring is generally defined in the literature as efforts made by one party to measure or meter the performance of another (Wathne *et al.*, 2007). Two forms of monitoring mechanisms including performance and behavior monitoring have been identified in the extant literature (Anderson and Oliver, 1987). Performance monitoring is based on measuring the visible consequences of a partner actions, such as delivery time, order accuracy, and product quality. In contrast, behavior monitoring is based on evaluating the processes that are expected to produce the focal outcomes.

It has been argued that advanced IT systems can facilitate the acquisition of performance data and motivates firms to increase their monitoring efforts *vis-à-vis* their exchange partners (Jacobides and Croson, 2001; Yamin and Sinkovics, 2007). For example, it has been shown that IT systems can help Dell to monitor the performance metrics of their original design manufacturer partners and relinquish their behavior monitoring against their partners (Pande *et al.*, 2006).

3.3.4 Transaction specific investments. Transactional specific investment has been regarded a key concept in TCE research (Williamson, 1975). According to TCE, asset specificity creates sunk cost in the exchange and thus reduces a risk of partner opportunism. Several studies have examined asset specificity as an antecedent of the safeguarding problem in interfirm exchange (Rindfleisch and Heide, 1997). Others argue that asset specificity can create bonding effects due to its specialized nature (Dyer and Singh, 1998; Rokkan *et al.*, 2003). Hence, asset specificity can be viewed as a strategic asset in supporting exchange relationship and create value for both channel parties (Jap, 1999).

As noted previously, recent research has argued that IT capabilities can facilitate firm business process and domain knowledge asset specificities and thus reinforce mutual commitment between parties in supply chain relationship (Subramani, 2004). Therefore:

P2. The relationship between IT capabilities and performance outcomes (strategic, operational and opportunism related) is mediated by coordination, monitoring, absorptive capacity and transaction specific investments.

3.4 Moderators effects

There is a nascent stream of IT business value research which incorporates the external environment of trading partners, uncertainty and culture and country factors (Bello *et al.*, 2004; Erumban and de Jong, 2006; Jaruwachirathanakul and Fink, 2005; Kim, D. *et al.*, 2005; Melville *et al.*, 2004). However, these external factors have not been fully explored. Thus, our conceptual model takes these external environment variables into account and argues that these variables moderate the impact of IT capabilities on business processes and supply chain performance in the international channel setting.

3.4.1 Communication context of culture. While IT focuses on facilitating communications between parties by connecting businesses with consumers and with other businesses, the literature suggests that the communication context of culture affects the communication style (Hall, 1976; Hall and Hall, 1987; Taylor *et al.*, 1997). According to Hall (1976), people in a high-context culture rely on the communication context much more than in a low context culture. This implies that businesses in high-context culture are likely to prefer in-person contacts to carry out everyday B2B activities and such preference will decrease the need for IT for effective communications. The low need for IT should be associated with a lower level of benefit from IT capabilities even if such IT capabilities are enhanced for the B2B activities.

IT further induces use of codified communication. A good example is the ever increasing use of e-mail for personal and business communications. Nowadays, both individual consumers and businesses rely on codified communication methods such as e-mails. However, in cultures where context based communication is preferred, businesses are less likely to appreciate codified communication and IT capabilities are, therefore, valued less. Accordingly, the impact of IT capabilities on international B2B processes will decrease as the B2B relationship involves a partner from a high context culture. Hence:

P3. To the extent a B2B relationship involves a partner from a culture that values the context element of the communication, a partner is less likely to improve its IT capabilities for the B2B activities.

3.4.2 Power distance. According to Hofstede (1984), power distance refers to the extent to which society members accept the uneven distributions of power. In a high power distance society, communications using advanced IT (e.g. e-mail or electronic documents) between managers and workers are considered rude (Murphy and Levy, 2006) and, therefore, often avoided as it creates some communication barriers due to lack of social context cues like body language, voice intonation, and interactions (Murphy and Levy, 2006). Plus, managers in high power distance cultures prefer to confirm their power through in-person communications. Under such business communication environments, B2B communications aided by IT capabilities are less appreciated and this is likely to lead to low need for IT capabilities for businesses communications in such cultures (Erumban and de Jong, 2006). To the extent that an international B2B relationship involves a partner from a high power distance culture, an involved partner will therefore be less likely to improve its IT capabilities for the B2B activities. Under such low appreciation of IT enabled communications in a high power distance society, the B2B processes are further less likely to be affected by IT capabilities. Thus:

P4. The greater the degree of power distance in a partner's country, the lower a firm's IT capability and the lower its impact on business process outcomes in international supply chain relationship.

3.4.3 Collectivism vs individualism. Collectivism, according to Hofstede (1984), concerns the extent to which society members prefer to be identified as a member of groups. In a collective culture, drawing a consensus is crucial as the society is based on the harmony among the members. In developing a consensus and maintaining the ties among members, therefore, people in a collective society prefer direct interactions to technology mediated contacts as such technology mediated contact is seen as less polite (Murphy and Levy, 2006). For them, personal interactions or meeting will be a much more effective way to maintain such ties as they will enhance interpersonal relations (Murphy and Levy, 2006). Therefore, in a society where in-person interactions are preferred, the value of advanced IT is less likely appreciated. Thus, we argue that a collective culture is less likely to appreciate the benefits of advanced IT and, therefore, leads to low IT capabilities of the partner from the culture (Erumban and de Jong, 2006).

With a strong preference to in-person based interactions in a collective society, businesses are less likely to accrue benefits from improvements in IT capabilities and, subsequently, the international B2B processes are less likely to be affected by improvements in IT capabilities when a partner from a collective culture is involved. Therefore, to the extent that an international B2B relationship involves a partner from a collective culture, the impact of IT capabilities of a partner on:

- coordination;
- absorptive capacity;
- monitoring; and
- transaction specific investments will decrease.

Hence:

P5. To the extent an international B2B relationship involves a partner from a collective culture, an involved partner is less likely to improve its IT capabilities for the B2B activities and the lesser is the extent to which positive impacts on business processes will be witnessed in an international supply-chain relationship.

3.4.4 Diffusion of information technology. Diffusion of advanced IT is affected by numerous factors including mode of communications preferred by the members of the society, availability of low cost IT hardware and software, and government policies toward adoption of advanced IT in the country (Jaruwachirathanakul and Fink, 2005; Mols, 2000; Pikkarainen *et al.*, 2004; Sathye, 1999). Owing to various reasons, different countries reveal different levels of IT diffusion. Moreover, such different levels of diffusion of IT or IT infrastructure across countries are likely to affect attitude of businesses toward advanced IT (Jaruwachirathanakul and Fink, 2005). That is, a high diffusion of IT in a country is likely to be associated with a positive attitude and enhanced perceived value of advanced IT by businesses, which should lead to improvements in IT capabilities of those businesses. Such enhancements of IT capabilities by involved partners should lead to great impact of IT capabilities for the

international B2B activities. Subsequently, to the extent an international B2B relationship involves a partner from a country with high diffusion of IT, the impact of IT capabilities of a partner on:

- coordination;
- absorptive capacity;
- monitoring; and
- transaction specific investments will increase.

Thus:

P6. The degree of the diffusion of technology in partner's country will positively affect the firm's IT capability and the extent of its impact on business processes in international supply chain relationship.

3.4.5 Interfirm interdependence. Some studies pointed out that the extent of interdependency between trading partners determines the benefits which can be accrued from IT in B2B contexts (Kim, D. *et al.*, 2005, Kim, K.K. *et al.*, 2005). However, empirical evidence in this field is still scarce. Recently, Kim, D. *et al.*'s (2005) study shows that criticality of partners will moderate the relationship between IT adoption in SCM and partner and firm coordination activities in the exchange relationships. Drawing on information processing theory, Kim, K.K. *et al.* (2005) argue that partner interdependence is positively associated with the extent of electronic information transfer capability in supply chain relationship.

Based on these arguments, we propose that the relationship between IT capabilities on business processes in international channel relationships will be moderated by partner interdependence. Hence:

P7. The greater the degree of interdependence between exchange parties, the greater the effect of IT capability on interfirm business process in international supply chain relationship.

3.4.6 Environmental uncertainty. Environmental uncertainty is a dimension which has been discussed widely in both TCE and RBV stream of literature. Environmental uncertainty incorporates many facets such as demand uncertainty (Kim, K.K. *et al.*, 2005), technological uncertainty (Kim, K.K. *et al.*, 2005), environmental turbulence (Pavlou and Sawy, 2006) and environmental dynamism (Jap, 1999) in the literature.

In IT-business value research, the impact of environmental uncertainty has not been fully investigated. In a recent review of RBV and IT-business value research, Wade and Hulland (2004) propose that the relationship between IT capabilities and performance will be stronger in turbulent environments. Based on information processing theory, Kim, K.K. *et al.* (2005) find that electronic monitoring is positively associated with demand uncertainty. Drawing from dynamic capability theory, Pavlou and Sawy (2006) find that the relationship between IT capabilities in new product development and dynamic capabilities is moderated by environmental turbulence. Thus, we conclude:

P8. The greater the environment uncertainty in the exchange relationship, the greater the effect of IT capability on interfirm business processes in international supply chain relationship.

4. Contribution and implications for future research

The conceptual framework presented in the present study contributes to the international marketing, strategy and IS literature by integrating diverse perspectives of IT and organizational performance, and combining two theoretical approaches, TCE and RBV into a more complete framework. This framework is suggested to serve as a basis for answering our main research question, whether and how firms that implement IT systems into their international supply chain activities can create competitive advantage. Several conclusions can be drawn from this conceptual framework. First, the implementation of IT into firm's international value chain operations is not a simple task but requires a lot of effort. We argue that the adoption of IT systems alone is not enough to support global coordination and control in firm's international supply chain. In fact, electronic integration, complemented by human IT resources and complementary organizational resources, can reinforce and restructure specific business processes and structures including coordination, absorptive capacity, monitoring and asset specificities. This in turn can lead to greater firm operational and strategic performance and curb foreign partner opportunism. This argument sheds some light on the long and resurgent debate over whether IT matters (Carr, 2003).

Second, the theoretical perspective from which IT business value research in international contexts should be conducted is neither RBV nor TCE alone. Although there is a growing consensus that RBV provides a robust framework for IT-business value research, it is not without drawbacks. In order to understand the process of the impact of IT on international supply chain management and value creation, it is recommended to take an interorganizational governance perspective which is rooted in TCE. The lack of integration in extant literature has led to ambiguity which disallows a full appreciation of the value creation process of IT in managing international supply chains.

Third, this study offered arguments that some cultural and country level factors can affect IT practices in a country and moderate the impact of such IT capabilities on international B2B activities based on the arguments and findings in the literature. Particularly, cultural factors such as communication context of culture (Hall, 1976), power distance, and collectivism (Hofstede, 1984) are likely to play a crucial role in recognizing the value of in-person interactions within a culture and, subsequently, in appreciating potential effects of IT capabilities on enhancing international B2B processes.

Finally, central to our proposed model is that internal and external environmental elements shape the IT-business value creation process. Previous research mostly focused on domestic channel settings, but for the international context, partner interdependence, and environmental uncertainty need to be considered analytically. The propositions developed in this paper thus open up several avenues for empirical work.

4.1 Theoretical implications

Building on the conceptual framework developed in the present paper, several research directions can be pursued in the future to enhance further knowledge of IT-business value research in international B2B contexts. The first opportunity is to empirically test the propositions developed in this paper. Moreover, different international channel relationships, such as manufacturers-foreign distributors, international outsourcing

relationships between customers and suppliers can be examined. Recent studies have developed scales to measure electronic integration, IT capabilities, business processes and different performance dimensions. These scales can be applied to conduct cross-sectional and possibly even cross-national survey studies. Despite arduous implementation challenges, a lot can be gained from longitudinal studies. These could enhance our understanding of the directionality/causality between IT and business value. Naude *et al.* (2000), for instance, argue that the impact of IT on business value may be a function of time lag effects.

Second, recent studies show that suppliers and customers may have different views on the functions of IT in supporting international business operation. Samiee and Walters (2006) for instance propose that "buyers are more likely to use the internet and e-commerce as means for seeking new foreign suppliers whereas suppliers are more interested in using IT as a tool for relationship building with customers" (Samiee and Walters, 2006, p. 595). Thus, future empirical work needs to account for both supplier and customer perspectives. In addition, it would be valuable to develop this research from a network perspective including focal firms, upstream suppliers, and downstream customers.

Third, this study only focuses on coordination and control roles of B2B e-commerce in international supply chains. The emerging sourcing technology such as online-reverse auction application is not included. This Internet technology has gained much attention recently (Jap, 2007) and is worth more future research in order to explore its impact on international business relationship and performance.

4.2 Managerial implications

Supply chain manager as well as IT managers or IT strategists can potentially benefit from this research. According to our analysis, the buildup of successful electronic partnerships is a complex task for companies, particularly given that international operations span across geographically and psychically dispersed markets. There is the danger of firms falling into what Yamin and Sinkovics (2006) call the "virtuality trap". Companies need to exploit different levels of electronic integration, based on data consistency and system integration to gain desired levels of control, coordination and learning among their channel partners.

Specifically, it is crucial for firms not only to invest in IT infrastructures, but also to complement these with other organizational resources, in order to establish a relational embeddedness between partners and standardized business processes in the supply chain. All IT capabilities in companies need to be managed effectively and maintained through core IS skills and techniques. Companies should try to develop and keep their own core IT skills instead of outsourcing to third parties. Otherwise, there is a danger of replication from competitors and loss of competitive positions.

Finally, leveraging IT capabilities to support management of international supply chains and achieving competitive advantage is contingent on the internal environment (interdependence structure between partners), external environments (environmental uncertainty), and cultural and other country level environments. Only by developing sufficient and appropriate IT capabilities to fit the external environment need, companies can effectively leverage IT capabilities to reinforce their channel processes and capabilities in international market, in turn, reap desired benefits.

5. Conclusion

IT has been regarded as a major breakthrough in improving the business efficiency and effectiveness in firm supply chain activities in domestic settings (Kim *et al.*, 2006). However, these benefits can potentially be much more significant in international supply chain activities and broadly all international B2B activities, as international business activities have to overcome cultural and language barriers in addition to greater geographic dispersion and time gap. Such challenges may become more manageable when they are carried out through advanced IT, which helps cross-cultural communications by allowing codified and, therefore, accurate information exchange between supply chain partners in a timely manner. We hope that this study sheds light on the promising area of inquiry in international marketing.

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