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Joint collaborative planning as a governance mechanism to strengthen the chain of IT value co-creation

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ABSTRACT

Drawing on the relational view of the firm, this paper examines the chain of IT-based co-creation of value and how joint collaborative planning between partners can strengthen this chain. Using data from 51 suppliers in the telecommunication equipment industry, our analysis demonstrates that the greater the partner-specific IT investments made by the firm, the greater its use of supply chain collaborative systems (SCCSs) with those partners and the greater the firm uses SCCSs with partners, the greater its benefits, through the generation of relational rents. Further investigation also shows that partner-specific IT investments is not a predictor of firm benefits and hence confirms the hypothesized chain of IT-based co-creation where IT investments encourage IT use, which in turn creates business value. Finally, our findings also show that joint collaborative planning between partners is an important governance mechanism, anchored on control and trust, that can strengthen the relationship between SCCSs use and firm benefits by impacting the other sources of relational rents tied to the use of SCCSs. This contribution should give academics and practitioners alike a better understanding of how both SCCSs and joint collaborative planning can foster the co-creation of value.

1. Introduction

The relationship between information technology (IT) and organizational performance has been a subject of long standing academic research and intense discussion (Carr, 2003; Dehning et al., 2004). This stream can be described as IT valuation research as it ascribes value to IT. It is an important stream of research that deals with business value, the economic impacts of IT and its manifestations at the level of the firm or network of firms (Kohli and Grover, 2008). Researchers have adopted various theoretical, conceptual, methodological and analytical approaches to examine the relationship between investments in technology and payoffs realized in terms of enhanced organizational performance (Brynjolfsson, 1993; Dedrick et al., 2003; Devaraj and Kohli, 2003). IT valuation research has now accumulated a critical mass of studies that demonstrate the relationship between IT and some aspect of firm value (Kohli and Grover, 2008).

The emergent research stream related to IT-based co-creation of value is particularly important in today's global, fast paced and customer-driven environment (Griffiths and Kempson, 2000; Wiersema and Bowen, 2008) where investment decisions are made beyond the purview of a single firm and the value implications of IT can extend to interorganizational relationships and networks (Kohli and Grover, 2008). Indeed, contrary to early work on transactional interorganizational information systems (IOISs) – defined in broadest terms as information systems (ISs) that facilitate the exchange of products,

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services and information between firms (Bakos and Brynjyoolfsson, 1993; Johnston and Vitale, 1988) – that suggests that the benefits from these information technologies are distributed unevenly and skewed in favor of the supply chain leader that owns and champions the introduction of the IOIS (Riggins and Mukhopadhyay, 1994; Srinivasan et al., 1994), this new research thrust relates to recent findings that have demonstrated that IOISs specifically geared to support supply chain collaboration (SCC) can foster symbiotic resource sharing and permit the partners involved to co-create value together (Klein and Rai, 2009; Kohli and Grover, 2008; Subramani, 2004). SCC is two or more autonomous firms that form long-term relationships and work closely to plan and execute supply chain operations toward common goals, thereby achieving more benefits than acting independently (Simatupang and Sridharan, 2005; Sheu et al., 2006). Researchers regard SCC as an alternative to make or buy decisions (Kay, 1997) where collaborating firms build relationships through specific investments, shared know-how and risks, complementary resources, and effective governance mechanisms (Bowersox et al., 2003; Malhotra et al., 2005; Spekman et al., 1998).

IT-based co-creation of value encompasses the idea that the IT value created is realized through actions of multiple parties and that this value emanates from robust collaborative relationships among firms (Kohli and Grover, 2008). Furthermore, to sustain IT-based co-creation, there must be incentives for parties to participate and equitably share the emergent value (Kohli and Grover, 2008). These conditions that differentiate IT-based co-creation from IT-based value alone explain why IOIS implemented to support SCC, usually called supply chain collaboration systems (SCCSs),[2] actually foster IT-based co-creation of value. Indeed, SCCSs shape how relationships are maintained and developed, promote symbiotic resource sharing between partners (Jayachandran et al., 2005) and can provide a competitive advantage to the firms involved (Subramani, 2004).

Despite their critical role in today's networked economy, and as such the necessity to study them in order for IT to be demonstrably relevant (Kohli and Grover, 2008), to date, still very few studies have actually examined how the use of SCCSs can foster the co-creation of value and provide benefits to each of the parties involved. Also, even though business executives and researchers continue to question the value of IT investments (Kohli and Grover, 2008), the issue of IT investments has also yet to be addressed in the emergent IT-based co-creation of value research stream. Furthermore, research has yet to consider the role of joint collaborative planning (JCP) between partners in supporting IT-based co-creation of value. Indeed, while recent studies highlight how a consultative approach to goal setting through JCP can radically alter the actual collaboration, the systems that will support them and the ensuing benefits (Bayraktar et al., 2009), the importance of this element as a governance mechanism to safeguard relation-specific IT assets and generate value has yet to be demonstrated in IT valuation research.

Based on the above considerations, the first objective of the present study is to investigate the chain of IT value co-creation where partner-specific IT investments made by the firm encourage the firm to use SCCSs with those partners, which in turn co-creates business value and provides benefits to the firm. More precisely, we first want to uncover how partner-specific IT investments made by the firm affect the firm's use of SCCSs with those partners and how using SCCSs with partners co-create value and improve the firm's benefits. The second objective of the research is to assess whether JCP can strengthen the chain of IT value co-creation. To attain these objectives, we draw insights from the relational view (RV) of the firm, which focuses on the potential of interfirm initiatives to generate relational rents (Dyer and Singh, 1998) through such value-adding initiatives as information exchanges across firms (Klein and Rai, 2009). This view suggests that specific collaborative partnerships can provide, directly or indirectly, four potential sources of interorganizational advantage: (1) relation-specific assets, (2) knowledge-sharing routines, (3) complementary resources/capabilities, and (4) effective governance. This research departs from past studies on IT value in four ways. First, while prior research on IT value has mostly viewed IT value from the perspective of a single firm with the premise that IT investments in a single firm leads to value to that firm (Kohli and Grover, 2008), this study focuses on the co-creation of value through IT. Second, while most prior work to date has examined the impact of either IT investments or IT usage on firm performance, this research considers the chain of IT value creation where IT investments influences IT use, which in turn impacts firm performance. Third, this research contributes to the literature by demonstrating that JCP is an important governance mechanism to safeguard asset-specific investments and improve the performance of business relationships. Finally, this study is amongst the few to draw on the relational view to examine the chain of IT-based co-creation of value and explain the role of JCP as a governance mechanism to strengthen the IT value co-creation sequence.

The rest of the paper is structured as follows. First, in the theoretical background section, we present the theoretical underpinnings of the RV and demonstrate that SCCSs foster the co-creation of value through the generation of relational rents. This section also provides a literature review on governance mechanisms in interorganizational relationships and argues that JCP is a governance mechanism that can foster the co-creation of value. Second, we present our research model and related hypotheses. Next, we present our data collection strategy used to gather data from 51 suppliers in the telecommunications equipment industry. This section also describes the operationalization of the research variables. Then, in the results section, we validate the measurement properties of the constructs and test the proposed research model. The paper concludes with a discussion about of the findings and directions for future research.

[2] Throughout the text, we refer to SCCSs in the plural as more than one system can support the various interfirm collaborative processes.

2. Theoretical background

2.1. The relational view of the firm

In contrast to the traditional industry structure view of competitive advantage that sees rent generation as a by-product of adversarial bargaining and emphasizes on industry barriers to entry as mechanisms to preserve rents (Porter, 1980) and to the resource-based view (RBV) of competitive advantage that sees rent generation as a consequence of the scarce physical resources, knowhow, technology, finances, and intangibles (e.g., reputation) owned within the firm (Barney, 1986; Wernerfelt, 1984), the main premise of the relational view of the firm (Dyer and Singh, 1998) is that relational rents and competitive advantage can be generated through value-adding initiatives enabled by critical resources that span firm boundaries and are embedded in interfirm resources and routines. Relational rent is defined here as a "supernormal profit jointly generated in an exchange relationship that cannot be generated by either firm in isolation and can only be created through the joint idiosyncratic contributions of the specific alliance partners (Dyer and Singh, 1998, p. 662)". Hence, arm's length relationships, characterized by nonspecific asset investments, minimal information exchange, low levels of interdependence as well as low transactions costs and minimal investment in governance mechanisms, are incapable of generating relational rents because there is nothing idiosynchratic about the relationship that enables the two parties to gain a competitive advantage. Buyer–seller combinations can generate relational rents and gain a competitive advantage only as they move the relationship away from the attribute of market relationship and accept to make relation-specific investments and combine resources in unique ways (Asanuma, 1989; Dyer, 1996).

More precisely, the RV argues that the relationship between firms is an increasingly important unit of analysis for understanding competitive advantage and identifies four potential sources of interorganizational competitive advantage. The first way a firm can generate relational rents is by investing in interfirm relation-specific assets. Interfirm relation-specific assets are assets jointly created by partners to develop a competitive advantage (Teece, 1987). They represent sunk costs that have little value outside the exchange relationship for which they were created (Rindfleisch and Heide, 1997). This theoretical proposition is based on Amit and Schoemaker's (1993) argument that specialization of assets is required to generate rents as well as other findings that have demonstrated that productivity gain in the value chain are possible when partners make idiosyncratic investments (Williamson, 1975). According to the RV, two sub-processes influence the ability of partners to generate this type of relational rents: (1) the length of the governance arrangement designed to safeguard against opportunism and (2) the total volume (scale) and breadth (scope) of transactions between the alliance partners.

The second way a firm can generate relational rents is by relying on interfirm knowledge-sharing routines. Interfirm knowledge-sharing routines are regular patterns of interfirm connections that allow the creation, recombination and transfer of specialized knowledge (Grant, 1996). This proposition is based on studies suggesting that partners are often an indispensable source of ideas and information that results in new and better technology and innovations. Two sub-processes influence the ability of partners to generate this type of relational rents. To start, the ability to exploit knowledge from outside the firm is dependent on prior related knowledge or the partner-specific absorptive capacity. Partner-specific absorptive capacity is defined as a firm's capability to recognize and assimilate valuable knowledge from a particular partner. This capacity requires the implementation of interorganizational collaborative processes that allow the systematic identification and transfer of valuable know-how across organizational boundaries. The partners' ability to generate rents through knowledge is also dependent on the alignment of incentives that encourages the partners to be transparent, to transfer knowledge and not to free ride on the knowledge acquired from the partner.

The third way a firm can generate relational rents is by leveraging the complementary resource endowments of an alliance partner. Dyer and Singh (1998) define complementary resource endowments as "distinctive resources of alliance partners that collectively generate greater rents than the sum of those obtained from the individual endowments of each partner (pp. 666–667)". This proposition is based on cases that exemplify how, by bringing distinctive resources to the alliance and combining them with the resources of the partner, a firm can benefit from a synergic effect whereby the combined resources endowments were more valuable, rare and difficult to imitate than the distinctive resources before they were combined. Two sub-processes influence the ability of partners to generate this type of relational rents. To begin, a firm's ability to identify and evaluate partners with complementary resources depends on its prior alliance experience, its aptitude to codify knowledge and the extent to which it occupies an information-rich position within social/economic networks. The ability of alliance partners to realize benefits from complementary strategic resources is also conditioned on compatibility in decision processes, information and control systems and culture.

The fourth way a firm can generate relational rents is by choosing a governance structure (safeguard) that minimizes transaction costs and/or maximizes value. The efficiency facet of the proposition rests on the economic advantage of matching governance structures with exchange attributes (Williamson, 1991) while the effectiveness facet of the proposition rests on literature that emphasizes the influence of governance in value-creating initiatives such as investing in relation-specific assets, sharing knowledge or combining complementary strategic resources. As such, this source of relational rents can influence the other three sources of relational rents identified above. According to the RV, self-enforcing governance mechanisms (e.g., trust, financial hostage) are more effective than third-party enforcement mechanisms (e.g., legal contracts) at both minimizing transaction costs and maximizing value creation activities. Likewise, within the self-enforcement mechanism category, informal safeguards (e.g., trust) are more likely to generate relational rents than formal relational rents (e.g. financial hostages).

Besides examining how firms generate relational rents, the RV also identifies six isolating mechanisms that subsequently preserve those rents (Dyer and Singh, 1998). First, causal ambiguity, which is ambiguity about the link between firm resources and sustained competitive advantage (Reed and DeFillippi, 1990; Barney, 1991), makes it very difficult for competitors to ascertain what generates the returns. Second, time compression diseconomies prevent rival firms from immediately replicating strategic interfirm resources and routines. Third, the interconnectedness of current relation-specific investments with previous relation-specific investments makes it difficult for competitors to imitate practices or investments. Fourth, partner scarcity makes it difficult for a competitor to find a partner with the required complementary resources. Fifth, resource indivisibility makes it unlikely that competitors can access the capabilities of a potential partner because these capabilities have co-evolved with another firm. Sixth, a distinctive and complex institutional environment with its particular formal and informal rules is impossible to replicate.

2.2. SCCSs to foster the co-creation of value through the generation of relational rents

According to the RV, alliances (or collaborative relationships), contrary to arm's-length market relationships, are characterized by substantial information/knowledge exchange between the partners involved that results in joint learning (Dyer and Singh, 1998). The arguments of the RV describing the four potential sources of interfirm competitive advantage, namely (1) relation-specific assets, (2) knowledge sharing routines, (3) complementary resources/capabilities, and (4) effective governance, also imply the necessity for collaborative partners to share information/knowledge in order to generate these potential sources of rent. Hence, even though the RV does not directly refer to information systems, the value of SCCSs in the view is implicit as these systems allows collaborative partners to engage in customized interlinked processes that enable rich (broad-ranging, high quality, and privileged) information sharing as well as the creation of new knowledge (Cachon and Fisher, 2000; Hagel and Brown, 2005; Lee et al., 2000; Malhotra et al., 2005; Patnayakuni et al., 2006; Saeed et al., 2011). Anchored on the RV, the study of Patnayakuni et al. (2006) is a very good example to demonstrate the critical role of IT to support collaborative relationships. Indeed, in their study on the relational antecedents of information flow integration for supply chain coordination, Patnayakuni et al. (2006) demonstrate that relational interaction routines, "defined as the degree to which informal and formal mechanisms are established for the exchange of information and knowledge between the focal firm and its supply chain partners (p. 23)", positively affect information flow integration for coordination. The authors also demonstrate that relational asset specificity and long-term orientation are two antecedents of relational interaction routines.

More precisely, SCCSs can foster the co-creation of value through the generation of relational rents that provide supranormal benefits to each of the parties involved. Indeed, a handful of IS authors have relied on the RV to demonstrate that SCCSs are critical interfirm resources that can generate rents and improve certain aspects of a supply chain performance (Kim et al., 2011; Klein and Rai, 2009; Rosenzweig, 2009; Subramani, 2004; Wang and Wei, 2007). For example, Kim et al. (2011) argue that IOISs are relation-specific assets that, by providing an electronic channel through which firms can instantly see their partner firm's information without incurring significant costs, have the potential to achieve relational rents by reducing communications errors, lowering total value chain costs as well as fostering product differentiation, organizational learning and knowledge exchange. The authors also demonstrate that IOIS visibility positively influences joint profit performance and the supplier's expectations of relationship continuity. Klein and Rai's (2009) results also provide strong support for the core tenets of the relational view in the context of logistics partnership. More precisely, these authors suggest that flows of strategic information between partners represent the exchange of complementary strategic resources, that this exchange is characterized by time compression diseconomies and is facilitated by asset interconnectedness between partners, and that these complementary strategic resources generate relational rents that provide benefits to both partners involved. Besides demonstrating that strategic information flows influence the performance of the relationships, they also demonstrate that IT customization and trusting beliefs between the partners influence the performance of the relationship.

Taken as a whole, findings from the research on the co-creation of value through the use of SCCSs can be summarized as follows. First, the SCCS is a critical interfirm resource that can generate different relational rents and is instrumental in co-creating business value through the generation of these rents (Kim et al., 2011; Klein and Rai, 2009). Second, to generate relational rents, SCCSs must foster interfirm information flows related to one or more of the following six processes: product development, sales/demand forecasting, production scheduling, inventory management, logistics management and order scheduling and tracking (Klein and Rai, 2009; Subramani, 2004). Finally, through their use, SCCSs can provide both strategic and operational benefits to the firms involved (Rosenzweig, 2009; Subramani, 2004). Hence, SCCSs represent a type of operational strategic information systems (SISs). SISs are different from other systems as they are intended to enable organizational strategic objectives and integrate processes with customers and suppliers (Miller, 1986) that either entail a radical impact on a firm's value chain or dramatically change the relationship between the firm and its environment (Bergeron et al., 1991). Operational SISs are also designed to have an impact on the operations of the organization and are likely to have an effect on work tasks as they require changes in procedures, resource allocations, and job descriptions (Segars and Grover, 1999; Walsham and Waema, 1994).

Despite these advances, research on the co-creation of value through the use of SCCSs has yet to examine the issue of IT investments and whether effective governance can influence the other sources of relational rents generated through the use of SCCSs.

2.3. Governance mechanisms in interorganizational relationships

Coase (1937) initially proposed that firms and markets are alternative governance structures that differ in their transaction costs. Later, Williamson (1975, 1985) added considerable precision to Coase's work by identifying the types of exchanges that are more appropriately conducted within firm boundaries (i.e., hierarchy) than within market. Since then, various governance mechanisms have been proposed in the literature to manage relationships and safeguard related specific assets (Heide and John, 1988; Heide and John (1990); Lusch and Brown, 1996; Noordewier et al., 1990; Stump and Heide, 1996). For example, Heide and John (1988) suggest that manufacturers' representatives can safeguard the assets they invest in their manufacturers by balancing their dependence through the establishment of offsetting investments in their customer relationships. Heide and John (1990) examine how buyers and sellers can use close relationships to safeguard specific relationship investments and adapt to uncertainty. Stump and Heide (1996) also demonstrate how buyers can safeguard their specific assets invested in suppliers through such control mechanisms as partner selection, incentive design and monitoring. These mechanisms are classified as "hybrid" governance mechanisms in the transaction cost analysis (TCA) literature as they relate to how governance problems can be managed without common ownership (i.e., complete integration) (Rindfleisch and Heide, 1997).

A close examination of the various forms of governance mechanisms proposed in the literature to safeguard relation specific assets exemplifies that there are two contrasting approaches to interorganizational governance. The first governance approach relies on control to minimize opportunistic behavior and safeguard relation specific assets. This approach relates to third-party enforcement of agreements (e.g. legal contracts) and formal self-enforcement mechanisms (e.g. financial hostages) proposed in the RV. Governance mechanisms of this type include legal bonds (Cannon et al., 2000) and explicit contracts (Lusch and Brown, 1996). The second governance approach relies on trust between the partners to safeguard relation-specific assets. This approach relates to informal self-enforcement mechanisms proposed by Dyer and Singh (1998). Governance mechanisms of this type include the goodwill trust (Gulati, 1995) and embeddedness (Uzzi, 1997). Despite their contrast, these two governance approaches are often complementary as many effective alliances use multiple governance mechanisms simultaneously (Borch, 1994), often beginning with those based on control and then also encompassing those that foster mutual trust (Gulati, 1995). Indeed, control and trust co-exist in relationships as each assumes the existence of the other, refer to each other, and create each other (Möllering, 2005).

In addition to safeguarding relation specific assets, governance mechanisms can provide various benefits to the partners involved a relationship. For example, Heide and John (1992) have demonstrated that buyers' investments in specific assets lead to increased control over supplier decisions for high level of relational norms. The authors measure the governance mechanism, relational norms, as a perception of bilateral expectations in three areas: flexibility, information exchange and solidarity. Their flexibility items describe the parties' expectations of making adjustments to the relationship to adapt to circumstance changes. The information exchange items express the parties' willingness to share information to help the other party when needed. The solidarity items express the parties expected efforts toward preserving the relation. Since then, several authors have demonstrated that relational norms can positively affect exchange performance (Cannon et al., 2000; Lusch and Brown, 1996; Siguaw et al., 1998). More recently, authors have also demonstrated that relational interaction routines positively affect information flow integration between supply chain partners (Patnayakuni et al., 2006) and that relational governance leads to greater supply chain information visibility (Wang and Wei, 2007). Following the RV logic, it could be argued that each of these benefits relates to the generation of relational rents.

2.4. Joint collaborative planning as a governance mechanism

JCP is the first activity carried out jointly by the supply chain partners. JCP can be defined as a process that orients the plans of individual firms toward each other in order to enable joint planning across organizational boundaries (Gunter et al., 2006). In general terms, the activity is centered on a communicative and discussion-based approach that requires the consensus of all stakeholders during the process of planning (Kumar and Paddison, 2000). JCP is a recurrent activity that is usually prepared for a fixed period. It is important to note, however, that the joint planning may be reviewed a number of times during the same fixed period to ensure it continuously fulfills the needs of all partners. These adjustments may be in terms of forecasts, product assortments, inventory requirements, etc. (Simatupang and Sridharan, 2005).

The concept of JCP is best defined in the Collaborative Planning, Forecasting and Replenishment (CPFR) method. CPFR, a registered trademark of the Voluntary Interindustry Commerce Solutions (VICS) Association, is viewed as an important approach to the coordination of processes between participants in a supply chain (Skjoett-Larsen et al., 2003) and represents a well-defined framework aimed at structuring and guiding partners in setting up their relationship and processes (Attaran and Attaran, 2007; Andrews, 2008). JCP actions are conducted during the first activity of CPFR (entitled Strategy and Planning). During JCP, partners establish the ground rules of the relationship. According to VICS (2004), this activity requires two complementary steps: "collaboration arrangement" and "joint business plan". In the first step, collaboration arrangement, the partners assign roles, responsibilities, checkpoints and escalation procedures as well as identify the significant events that affect supply and demand for a period. Amongst the various tasks within this step, the partners determine the goals and objectives of the collaboration, specify the requirements of the planning process and determine their respective information sharing needs. The second step of JCP, joint business plan, pinpoints and plans the categories of items that make up the core of the collaboration initiative. Similarly to the collaboration arrangement step, the joint business plan step defines

the requirements of the relationship but at a much more detailed level, that is for specific categories of items. Hence, two firms conducting JCP will generally agree on a collaboration arrangement once a period, but will develop a number of joint business plans if they are to plan collaboration for several families of products during that same period. Furthermore, for certain periods, partners may choose to focus solely on the joint business plan step.

JCP is a governance mechanism that relies on control to minimize opportunistic behavior and safeguard relation-specific assets. Indeed, during the first step of collaboration agreement, partners specify clear work procedures to delineate and monitor the contribution of each party to the collaboration as well as to resolve collaboration disagreements when they appear. Furthermore, during this step, the establishment of a front-end agreement between the parties also dictates partners' behavior in order to minimize opportunistic behavior and maximize the quality of the relationship. A contract is an agreement for the exchange of a product/service (Mooi and Ghosh, 2010). Whether it is an explicit legal agreement or an implicit normative agreement (Macneil, 1980), its main purpose remains to clarify the subject matter of the exchange in sufficient detail to create a shared set of rules, procedures, responsibilities, and expectations (Gilson, 1984). Through both legal (i.e., explicit) and extralegal (i.e., normative or social) terms, a contract creates a common language and homogeneous expectations that help minimize wasteful renegotiation and optimistic behavior (Mooi and Ghosh, 2010). As such, a contract becomes a mechanism that creates value by reducing the risk and uncertainty in exchange relationships (Lusch and Brown, 1996). And, by reducing the uncertainty, the partners involved in the exchange will be more willing to invest in specialized assets (Williamson, 1975, 1991) to maximize benefits. The second step of JCP is also an effective control mechanism to minimize opportunistic behavior. Indeed, the establishment of a joint business plan requires a detailed analysis of the collaborative processes that compels the partners to jointly dictate and agree upon the responsibilities of each the parties involved (Simatupang and Sridharan, 2005).

JCP is a governance mechanism that also relies on trust to minimize opportunistic behavior and safeguard relation specific assets. Indeed, JCP is only possible when there is mutual trust between the partners (Skjoett-Larsen et al., 2003). Furthermore, as both steps of JCP are conducted jointly by the partners to assure the co-creation of value, JCP also breeds more mutual trust (Wilding and Humphries, 2006). Mutual trust in JCP is of such importance that some authors have gone so far as to argue that trust is more important than the terms of the contract itself (Skjoett-Larsen et al., 2003).

In addition to safeguarding relation-specific assets, JCP is also an effective governance mechanism that can generate rents by either lowering transaction costs or providing incentives for value-creating activity (Dyer and Singh, 1998). Indeed, by specifying clear work procedures and a front-end agreement between the parties, JCP is a governance mechanism based on control that will surely minimize transaction costs (Wang and Wei, 2007). For example, by jointly determining how to resolve collaboration disagreements and agreeing on measures and actions to be taken by both parties in regards to particular collaborative situations (e.g., low inventory, stockouts, developing a promotional plan), confrontations between the parties will be limited while the time spent and the number of interactions required to settle the numerous issues that will arise during the relationship will be minimized. Furthermore, by requiring and fostering mutual trust, JCP will also encourage partners to invest more in relation-specific assets, to share more knowledge and/or invest more in complementary strategic resources (Wang et al., 2006). For example, when a manufacturer conducts JCP with its suppliers, it will be more willing to invest in relation-specific IT assets to virtually integrate its collaborative activities with upstream partners. This integration will allow suppliers to be more responsive to the manufacturer's demand while maximizing the manufacturer's cost advantage and flexibility (Wang et al., 2006).

3. Research model and hypotheses

Fig. 1 presents our research model. Given our focus on investigating the chain of IT value co-creation, it posits a first relationship between partner-specific IT investments made by the firm and the firm's use of the collaborative systems with those partners and a second relationship between the firm's use of SCCSs with partners and firm benefits. Finally, the model also posits that JCP as a governance mechanism can strengthen the chain of IT value co-creation.

3.1. Partner-specific IT investments and SCCSs use

SCCSs use can generate relational rents by means of interfirm relation-specific assets, interfirm knowledge sharing routines and complementary resource endowments (see Section 3.2). To be able to generate these rents, the SCCSs must facilitate the exchange of idiosyncratic information and know-how between the partners involved. The use of SCCSs to foster idiosyncratic interfirm linkages is only possible when partner-specific IT investments are made to implement and maintain electronic dyads that permit the tight integration of collaborative processes that enables customized interfirm routines (Choudhury, 1997; da Silveria and Cagliano, 2006). Indeed, electronic dyads, such as dedicated electronic data interchange (EDI), dedicated extranet and customized B2B interfaces to integrate partners' systems, establish individual and customized electronic links between a buyer (supplier) and each of a select set of business counterparts (i.e., a one-to-one relationships) (Choudhury, 1997, p. 3). Each electronic dyad requires relation-specific asset investments into computing/telecommunication resources to tailor the collaborative systems to the particular needs of the two partners involved (Kim et al., 2006), which have little value for other economic activities outside the relationship. Contrary to

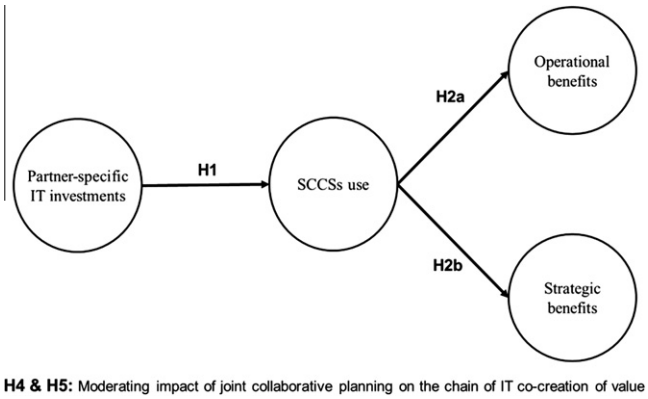

Fig. 1. Proposed research model.

electronic dyads that require relation-specific IT, multilateral IOISs, such as Web sites and extranets, do not require relation-specific investments but rather nonspecific investments that permit the firm to communicate with a large, potentially unlimited, number of partners over a single logical interorganizational link (Choudhury, 1997; da Silveria and Cagliano). Hence, even though both electronic dyads and multilateral IOISs can reduce transaction costs (Malone et al., 1987; Malone and Crowston, 1994), relying on SCCSs to generate relational rents requires partner-specific IT investments into electronic dyads.

The idea of asset interconnectedness across organizational boundaries put forth in the RV can also provide a strong argument for the relationship between partner-specific IT investments and SCCSs use. Indeed, there is a cumulative (snowball) effect that is due to the interconnectedness of current SCCSs use with previous partner-specific IT investments. More precisely, relation-specific investments (i.e., partner-specific IT investments) create conditions that make subsequent specialized investments (i.e., SCCSs use) economically viable.

The above arguments lead to the first hypothesis:

Hypothesis 1. *The greater the partner-specific IT investments made by the firm, the greater its use of SCCSs with those partners.*

3.2. SCCSs use and firm benefits

Several IS authors have demonstrated that SCCSs use can foster the co-creation of value through the generation of relational rents by means of interfirm relation-specific assets, interfirm knowledge sharing routines and complementary resource endowments (Klein and Rai, 2009; Malhotra et al., 2005; Rosenzweig, 2009; Subramani, 2004). The first source of relational rents generated by SCCSs use is interfirm relation-specific assets. Indeed, SCCSs use involves human asset specificity through the accumulation of specific information, language, and know-how over time that should provide value to each of the firms involved in the partnership (Rosenzweig, 2009). Over time, SCCSs use can also prompt specialized routines and/or standard procedures, which enable partners to work together more efficiently and effectively (Rosenzweig, 2009). Subramani's (2004) has also demonstrated that the use of supply chain management systems (SCMSs) provide strategic benefits to suppliers through the creation of business process specificity.

The second source of relational rents generated by SCCSs use is the ensemble of processes that facilitate the creation, transfer and/or recombination of knowledge amongst collaborative partners (Malhotra et al., 2005; Rosenzweig, 2009; Subramani, 2004). Subramani's (2004) has demonstrated that the use of supply chain management systems (SCMSs) provide both operational and strategic benefits to suppliers through the creation of domain-knowledge specificity.

Complementary resource endowments can generate rents only if (1) neither firm in the partnership can purchase the relevant resources in a secondary market, and (2) these resources are indivisible creating an incentive for each firm to form an alliance in order to access the complementary resources (Dyer and Singh, 1998). Consequently, the third source of relational rents generated by SCCSs use relates to the interorganizational systems' ability to leverage the complementary resource endowments of partners (Klein and Rai, 2009). Indeed, the strategic information exchanged through SCCSs use represents a distinctive, sensitive and indivisible resource that is only available through partners and not markets (Oliver, 1997). For example, through the use of their SCCSs, Procter & Gamble and Wal-Mart can share strategic information related to forecasting, planning and replenishment that has allowed both parties to reap significant operation, tactical and strategic benefits that could not have been available otherwise (Grean and Shaw, 2002).

These arguments lead to the second hypothesis:

Hypothesis 2a. *The greater the firm uses SCCSs with partners, the greater its operational benefits.*

Hypothesis 2b. *The greater the firm uses SCCSs with partners, the greater its strategic benefits.*

3.3. JCP to strengthen the relationship between partner-specific IT investments and SCCSs use

Because JCP encompasses the partners' discussion and assignment of the competencies, resources and systems to the collaboration, the governance mechanism will strengthen the relationship between partner-specific IT investments and SCCSs use. In the case of a new collaboration, JCP defines the information sharing needs to support the collaboration and specifies which IT systems must be developed, customized and/or bundled into the electronic dyad in order to support collaborative processes and provide supply chain visibility that will bring synergy to the pending relationship (Zhu and Kraemer, 2005). Indeed, as the "right" SCCSs to be used to support a relationship may vary according to the type of control required by the partners, and the level of trust between firms, JCP, through the development of a collaboration arrangement and a joint business plan, will specify which relation-specific IT investments are required to assure that the implemented electronic dyad is aligned to the collaboration climate and hence will be used and provide benefits to all the partners involved. In case of an existing relationship, JCP assures that past IT-based specific assets are utilized in the best possible way (VICS, 2004). For instance, if partners have already been using a particular SCCS to support information exchange on shortages and inventory (short term planning) and decide to take their relationship a step further by exchanging strategic information, the JCP activity will assure that the new IT functionalities required to support a long-term planning approach based on historical and prospective data will be built on the existing system or a complementary system that can be easily integrated to the latter, which in turn will foster more usage of the collaborative systems. Hence, by promoting relation-specific IT investments and taking into account the path dependency of these specific assets, JCP will strengthen the relationship between partner-specific IT investments and the use of SCCSs. These arguments lead to the third hypothesis:

Hypothesis 3. The relationship between the firm's partner-specific IT investments and its use of SCCSs with those partners will be stronger when the firm conducts a higher level of joint collaborative planning with partners than when it conducts a lower level of joint collaborative planning with partners.

3.4. JCP to strengthen the relationship between SCCSS use and firm benefits

The RV argues that the greater the volume of exchange is between the partners, the greater the potential will be to generate relational rents through relation-specific assets (see Section 2.1). Hence, considering that SCCSs use can foster the co-creation of value and provide operational and strategic benefits through the creation of interfirm relation-specific assets, and that JCP is a governance mechanism, based on control and trust, that fosters continuous interactions between the partners (VICS, 2004), the more a firm conducts JCP with partners, the greater the potential will be for the firm to generate operational and strategic benefits through the use of SCCSs with partners.

The RV also argues that (1) the greater the partner-specific absorptive capacity is, (2) the greater the alignment of incentives by alliance partners is to encourage transparency and reciprocity and to discourage free riding, the greater the potential will be to generate relational rents through knowledge-sharing (see Section 2.1). Hence, considering that SCCSs use can provide operational and strategic benefits through the creation of knowledge sharing routines, and that JCP is a governance mechanism based on control and trust that aligns partners incentives (VICS, 2004) while permitting collaborating firms to systematically identify valuable know-how and then transfer it to other (Dyer and Hatch, 2006), the more a firm conducts JCP with partners, the greater the potential will be for the firm to generate operational and strategic benefits through the use of SCCSs with partners.

Finally, the RV argues that the ability of partners to generate relational rents from complementary strategic resources increases with the degree of compatibility in their organizational systems, processes and cultures (see Section 2.1). Hence, considering that SCCSs use can provide operational and strategic benefits through complementary resource endowments, and that JCP is a governance mechanism based on control and trust that fosters the proliferation of jointly developed systems, processes and to a certain extent a culture based on tight collaboration (Kahn et al., 2006), the more a firm conducts JCP with partners, the greater the potential will be for the firm to generate operational and strategic benefits through the use of SCCSs with partners.

These arguments lead to the fourth and last hypothesis.

Hypothesis 4a. *The relationship between the firm's use of SCCSs with partners and its operational benefits will be stronger when the firm conducts a higher level of joint collaborative planning with partners than when it conducts a lower level of joint collaborative planning with partners.*

Hypothesis 4b. *The relationship between the firm's use of SCCSs with partners and its strategic benefits will be stronger when the firm conducts a higher level of joint collaborative planning with partners than when it conducts a lower level of joint collaborative planning with partners.*

4. Research design

4.1. Data collection strategy

This study was facilitated by the cooperation of a large, well-established original equipment manufacturer (OEM) in the telecommunications equipment industry. The telecommunications equipment industry includes all the companies involved in the manufacturing of the equipment and software needed for information processing and communication, including transmission and display. The OEM has a reputation of being an IT driven company and an innovator in regards to SCM practices. It orchestrates a complex supply network with several layers. The network operators (i.e., the end users of the optical products) are at the downstream end (top layer) of the network. The OEM integrates the final systems (i.e., products) at the next layer of the chain. The other layers comprise the first tier suppliers, the second-tier suppliers and other upstream suppliers. First tier suppliers are assemblers and second tier suppliers are sub-assemblers. The OEM relies on assemblers because of their ability to produce at a lower cost and with more flexibility. Sub-assemblers center their work on component manufacturing and subsystem assembly; they are sometimes subsidiaries of large multinationals. It is important to note, however, that a particular supplier can service the OEM in different ways at once. For instance, a supplier can service a product of the OEM by taking the role of an assembler, while servicing another product of the system integrator by taking the role of a sub-assembler.

We collected field data by surveying the suppliers that serviced the OEM as assemblers. The survey instrument was developed based on the fieldwork and a review of prior studies. The questionnaire comprised a broad set of variables related to supply chain management and IOISs. Although these variables relate to one firm, they reflect the various initiatives taken by these firms and the nature of the relationship they maintain with partners. Hence, the conceptualization of the variables ultimately studies the dyadic relationship between the firm and the partner. Chen and Paulraj (2004) adopted the same approach in their important study that identifies and consolidates various supply chain initiatives and factors to develop key SCM constructs conducive to advancing the field. Furthermore, following the OEM's suggestions, the instrument was structured in order to capture data on both the dyadic relationship between the supplier and its customer (downstream), as well as the dyadic relationship between the supplier and its own supplier (upstream). Hence, besides descriptive statistics, each variable was captured twice to gather data from these two complementary perspectives.

The instrument was refined with the help of four senior managers at the OEM and ten senior managers working for suppliers. The supply chain managers at the 130 suppliers that were considered assemblers for this particular OEM (76% in the United States, 12% in Canada and 12% in the rest of the world) were then identified and contacted with the help of the OEM. According to the OEM, more than 75% of these suppliers also serviced competing OEMs, but not necessarily as an assembler. The request to answer the electronic questionnaire was then sent out twice over a 3-month period. A total of 53 companies participated in the Web survey, for a 40.8 % response rate. This high response rate can be explained by the fact that: (1) the request to answer the questionnaire was sent directly by the OEM since one of the main objectives of this joint research initiative between the OEM and academia was to improve the OEM's supply chain, and (2) the questionnaire did not require suppliers to provide any information that may be of confidential nature (e.g., performance data) as the survey instrument was constructed with perceptual measures only. No significant differences (goodness of fit tests) were found between respondents and non-respondents with respect to firm size.

Different subsets of data from this sample of 53 suppliers have been analyzed in prior studies. Our past work has mainly relied on data tied to the dyadic relationship between the supplier and its upstream supplier to reveal the importance of collaborative planning to generate operational benefits at lower levels of the supply chain (Hadaya and Cassivi, 2007). The present study, which focuses on how IT can provide strategic value, analyzes a different subset of data from the sample. This particular subset, which comprises data from 51 suppliers, relates to dyadic relationships between the supplier and its customer.

4.2. Measurement scales

To assess partner-specific IT investments, respondents were asked to assess what percentage of their IT investments related to their supply chain collaborative relationships with customers are dedicated to design, implement and maintain individual electronic links with one or a selected set of customers (e.g., dedicated EDI, dedicated extranet). This variable was used in conjunction with another variable that assessed what percentage of their IT investments related to supply chain collaborative relationships with customers are dedicated to design, implement and maintain multilateral IOISs that allow the firm to communicate with a large number of customers (e.g. Web site, extranet). The sum of these two variables needed to be equal to 100. To facilitate the respondent's task, a definition of both electronic dyad and multilateral IOIS was provided in the survey instrument.

The CPFR standard of the VICS provides the most comprehensive framework for structuring JCP tasks between supply chain partners (Table 1). The first step of JCP, collaboration arrangement, comprises 11 tasks while the second step, joint business plan, comprises another five. We operationalized JCP as an index where we averaged the tasks to obtain a score for each step. Then, we averaged the scores of the two steps to obtain the JCP score for each firm. A similar procedure was used by Corsten and Kumar (2005) to operationalize an efficient customer response (ECR) adoption scale. Table 1 contains the tasks, means and standard deviations.

Table 1
JCP index.

Steps	Tasks	Mean of the task (standard deviation)	Mean of the step (standard deviation)	Mean of JCP (standard deviation)
Collaboration arrangement	Develop an agreement and statement of collaboration	6.429 (0.737)	5.275 (0.957)	5.268 (0.873)
	Determine goals and objectives of collaboration	5.122 (1.503)		
	Discuss and assign competencies, resources, and systems	5.262 (1.326)		
	Define collaboration points and responsible business functions	4.878 (1.503)		
	Determine information sharing needs	5.691		
	Include experience of previous collaboration	4.667 (1.51)		
	Define service and ordering commitments	5.976 (1.158)		
	Determine resource involvement and commitments	5.385 (1.206)		
	Determine how to resolve collaboration disagreements	5.17 (1.465)		
	Determine review cycle for collaboration agreement	4.65 (1.545)		
	Publish front-end collaboration agreement	4.718 (1.776)		
	Identify partnership strategies for categories of items	5.317 (1.105)		
	Develop category roles, objectives, and goals for categories of items	5.3 (1.265)		
	Develop joint promotional plan for categories of items	5.902 (0.995)	5.24 (1.015)	
	Develop item management profiles	5.154 (1.288)		
	Agree to a joint business plan for specific categories of item	4.615 (1.664)		

Table 2
Variables, items and sources.

Variables (no. of items)	Item description	Item abbrev.	Scale	Sources
Partner-specific IT investments	*What percentage of your IT investments related to your supply chain collaborative relationships with customers are dedicated to design, implement and maintain individual electronic links with one or a selected set of customers (e.g., EDI, dedicated extranet).*	n.a	Percentage	Inspired from Choudhury (1997)
SCCSs use (6 items)	*Your firm has integrated the following supply chain collaborative processes with customers using Internet-based interorganizational information systems.*		7-point Likert scale where 1 = "completely disagree" and 7 = "completely agree"	Adapted from Croxton et al. (2001), Subramani (2004), Frohlich and Westbrook (2002)
	– Product development	SCCS1		
	– Sales/demand forecasting	SCCS2		
	– Production scheduling	SCCS3		
	– Inventory management	SCCS4		
	– Logistics management	SCCS5		
	– Order scheduling and tracking	SCCS6		
Operational benefits (3 items)	*To what extent have your relationships with customers led you to:*		7-point Likert scale where 1 = "not at all" and 7 = "to a great extent"	Subramani (2004)
	– Be more cost efficient	OB1		
	– Improve or create of new processes	OB2		
	– Improve profitability	OB3		
Strategic benefits (3 items)	*To what extent have your relationships with customers led you to:*		7-point Likert scale where 1 = "not at all" and 7 = "to a great extent"	Subramani (2004)
	– Improve customer and market knowledge	OP1		
	– Facilitate new product introduction	OP2		
	– Develop new business opportunities	OP3		

To obtain a preliminary assessment of the validity of the research constructs, 10 suppliers participated in a pre-test of the survey instruments. Comments from the subjects resulted in minor changes to survey questions. Except for JCP, Table 2 presents the final operationalization of the research variables after these changes.

5. Data analysis and results

Due to our small sample size, we used partial least squares (PLS), specifically SmartPLS 2.0 (Ringle et al., 2005), to validate the psychometric properties of the scales used to measure the three constructs (Section 5.1) and analyze hypothesized associations predicted in H1 and H2 (Section 5.3.1). Unlike a covariance-based structural equation modeling method such as LISREL, PLS employs a component-based approach for estimation purposes (Lohmöller, 1989), and places minimal restrictions on the sample size and residual distribution (Chin et al., 2003).

Our sample of 51 was too small, however, to use a subsampling approach to test the interaction effects predicted in H3 and H4. As such, we used moderated regression analysis (MRA) to test the last two hypotheses of the research model (Section 5.3.2). This technique, which has been used in past studies for determining the influence of potential moderator variables (Baron and Kenny, 1986; Darrow and Kahl, 1982; McKeen et al., 1994; Stone and Holfenbeck, 1989), offers a straightforward and the most general method for testing contingency hypothesis in which an interaction is implied (Arnold, 1982; Cohen and Cohen, 1986; Hair et al., 1998).

5.1. Measurement model

We tested the measurement model by examining convergent validity and discriminant validity of the scales employed to assess SCCSs use, operational benefits and strategic benefits. Convergent validity of scale items was assessed using three criteria recommended by Fornell and Larcker (1981): (1) all item factor loadings (λ) should be significant and exceed 0.70, (2) composite construct reliabilities should be greater than 0.80, and (3) average variance extracted (AVE) for each construct should exceed the variance attributable to measurement error (i.e., AVE = 0.50). The first PLS model showed that one of the six items of SCCSs use had a low factor loading score. The item that appeared to be problematic (SCCS5: Logistics management) was removed and the model parameters were re-estimated. As shown in Table 3, standardized loadings for all scale items were significant at $p < 0.001$ and exceeded the minimum loading criterion of 0.70 in the second PLS model. Table 4 also shows that composite reliabilities (ρ_c) of all constructs exceeded the required minimum of 0.80 while the AVE values of the three constructs exceeded the threshold value of 0.50. Hence, all three conditions for convergent validity were met.

Discriminant validity between constructs was examined using Fornell and Larcker's recommendation that the square root of AVE for each construct should exceed all correlations between that and other constructs. From the data presented in Table 4, we can see that the highest correlation between any pair of constructs was 0.663 (between SCCSs use and strategic benefits in Model 1) while the lowest square root of AVE was 0.803 (corresponding to operational benefits). A second way to evaluate discriminant validity is to examine the factor loadings of each indicator. Each indicator should load higher on the construct of interest than on any other factor (Chin, 1998). Factor loadings and cross-loadings for the multi-item measures were calculated from the PLS output and are presented in Table 3. Inspection of loadings and cross-loadings confirms that the observed indicators demonstrate adequate discriminant and convergent validity.

5.2. Common method bias assessment

Because independent and dependent variables in the present study were measured by self-report methods, the measures may suffer from common method variance that could inflate observed relationships between constructs. However, steps were taken in the design of the study to reduce the likelihood of method bias. By guarantying anonymity of the respondents, assuring them that there were no right or wrong answers, requesting that each question be answered as honestly as possible, and providing no incentive for participating in the study, we reduced the likelihood of bias caused by social desirability or respondent acquiescence (Podsakoff et al., 2003). We also used two types of scale formats, percentage and 7-point Likert scale, to safeguard against common method bias (Podsakoff et al., 2003). Furthermore, the correlations between the research

Table 3
Loadings and cross loadings.

Scale item	SCCSs use	Operational benefits	Strategic benefits
SCCS1	**0.712**	0.189	0.401
SCCS2	**0.873**	0.279	0.623
SCCS3	**0.836**	0.213	0.510
SCCS4	**0.809**	0.479	0.588
SCCS6	**0.804**	0.368	0.610
OB1	0.390	**0.890**	0.246
OB2	0.339	**0.879**	0.280
OB3	0.182	**0.701**	0.164
SB1	0.523	0.317	**0.888**
SB2	0.599	0.250	**0.943**
SB3	0.571	0.252	**0.957**

*Mean item loadings calculated using bootstrap algorithm with 200 subsamples; all mean loadings significant at $p < 0.001$.

Table 4
Scale properties and descriptive statistics.

Variables	Mean	Standard deviation	Cronbach α	Composite reliability	AVE	Inter-construct correlations				
						(1)	(2)	(3)	(4)	(5)
(1) SCCSs use	4.946	1.200	0.921	0.904	0.654	**0.809**[b]				
(2) Operational benefits	4.967	0.826	0.749	0.866	0.685	0.389**	**0.803**			
(3) Strategic benefits	5.650	1.108	0.922	0.950	0.865	0.663****	0.376**	**0.930**		
(4) Partner-specific IT investments[a]	49.08	25.74	n.a	n.a.	n.a.	0.250*	0.183	0.064	-	
(5) Joint collaborative planning	5.214	0.884	n.a.	n.a.	n.a.	0.448***	0.325*	0.580****	0.122	-

p = level of two-tailed significance based on a normal distribution (Fisher transformation).
[a] Expressed as a natural logarithm in order to normalize the variables.
[b] Diagonal element in bold, represent the square root of AVE for that construct.
* $p < .10$.
** $p < .05$.
*** $p < .01$.
**** $p < .001$.

constructs varied while remaining at relatively low levels suggesting that substantial common method variance problem is not evident in our data (James et al., 1979).

Finally, we assessed the extent of common method variance (CMV) with two tests. First, we performed Harmon's single-factor test (Podsakoff et al., 2003) by including all reflective items into an exploratory factor analysis. The results revealed three factors with no single factor accounting for a majority of variance, suggesting no substantial CMV among the reflective scales. Second, we used Lindell and Whitney's (2001) marker-variable technique, which provides a quantitative estimate of the magnitude of CMV. Essentially, this technique requires researchers to identify a marker variable that should be theoretically unrelated to other variables. Once identified, researchers can partial out the correlation between the marker variable and variables of interest. If the correlation between the variables of interest remains significant (or not significant) after accounting for the marker, researchers can conclude the relationships were not contaminated by CMV. Contextually, we needed to test the relationships between partner-specific IT investment and SCCSs use, SCCSs and operational benefits, SCCSs use and strategic benefits, JCP and operational benefits as well as JCP and strategic benefits.

To apply Lindell and Whitney's (2001) technique, "Number of suppliers you deal with" was designated as the marker variable. Accordingly, to test whether or not the relationships between the constructs of interest were contaminated by CMV, we partialled out the influence of "Number of suppliers you deal with", a variable that should not be related to the constructs of interest (cf. Cohen-Charash and Spector, 2001). After partialling out the influence of number of suppliers: (1) the relationship between partner-specific IT investments and SCCSs use remained insignificant, $t(50) = -0.657$, $p > .10$; (2) the relationship between SCCSs use and operational benefits remained significant, $t(50) = 2.126$, $p < .05$; (3) the relationship between SCCSs use and strategic benefits remained significant, $t(50) = 5.503$, $p < .01$; (4) the relationship between JCP and operational benefits remained significant, $t(50) = 1.995$, $p < .10$.; and (5) the relationship between JCP and strategic benefits remained significant, $t(50) = 5.230$, $p < .01$. These findings, combined to those exposed above, suggest the lack of CMV bias in our observed data sample.

5.3. Hypothesis testing

5.3.1. PLS analysis (H1 and H2)

According to Chin (1998), a rule of thumb regarding sample size when using testing a structural model with PLS is that there should be 10 cases per predictor, whereby the overall sample size is 10 times the largest of two possibilities: (1) the number of indicators for the scale with the largest number of indicators or (2) the largest number of structural paths directed at a particular construct in the structural model. Hence, our sample size of 51 was adequate since the largest number of indicators per construct was five and the largest number of paths directed to any construct in the model was one.

Assessment of the structural model involves estimating the path coefficients and the R^2 value. Path coefficients indicate the strengths of the relationships between the independent and dependent variables, whereas the R^2 value is a measure of the predictive power of a model for the dependent variables. A bootstrap resampling procedure (200 resamples) was used to determine path coefficients (represented as Standardized β) and respective t-values. Fig. 2 summarizes the results. Hypothesis 1 tested a positive relationship between partner-specific IT investments and SCCSs use; this hypothesis is supported (Standardized $\beta = 0.234$, $t = 2.463$). Hypothesis H2a tested a positive relationship between SCCSs use and operational benefits; this hypothesis is supported (Standardized $\beta = 0.391$, $t = 4.659$). Finally, H2b tested a positive relationship between SCCSs use and strategic benefits; this hypothesis is supported (Standardized $\beta = 0.712$, $t = 11.331$).

The explanatory power of the proposed model, or nomological validity, was assessed by observing the R^2 of endogenous constructs in the structural model estimation. Falk and Miller (1992) recommend that R^2 must be at least 0.10 in order for the latent construct to be judged adequate. As all of the R^2 values satisfy this recommendation (see Fig. 2), the nomological validity was satisfactory.

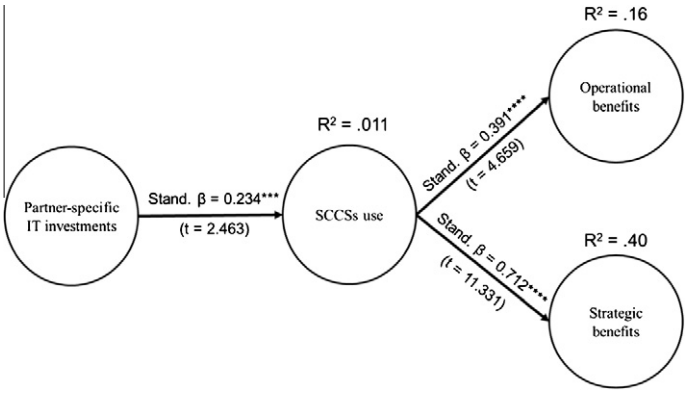

Fig. 2. The estimated model ($n = 51$).

5.3.2. Moderated regression analysis (H3 and H4)

Moderated regression analysis (MRA) was used to test the potential moderating impact of JCP on the three relationships in the research model (Fig. 1). The approach recommended by Sharma et al. (1981) was followed for applying the MRA technique and identifying the nature of the moderator variable. Their approach considers three regressions where y is the dependent variable, x the independent variable and m is the potential moderating variable.

$$y = a + b_1 x \tag{1}$$

$$y = a + b_1 x + b_2 m \tag{2}$$

$$y = a + b_1 x + b_2 m + b_3 xm \tag{3}$$

According to Sharma et al. (1981), if Eqs. (2) and (3) are not significantly different (i.e., $b_3 = 0$; $b_2 \neq 0$), z is not a moderator. If Eqs. (1) and (2) are not different but are different than Eq. (3) (i.e., $b_2 = 0$; $b_3 \neq 0$), m is a pure moderator. Finally, m is classified as a quasi moderator if Eqs. (1), (2) and (3) are different from each other (i.e., $b_2 \neq b_3 \neq 0$).

All constructs were averaged to form a composite. Once the composites were formed, we mean centered all variables to avoid any potential threat of multicollinearity when calculating the interaction term (Cohen and Cohen, 1986). Interaction terms were created taking the product of the mean-centered variables. Multicollinearity was not a problem for any of the MRA as the variance inflation factor (VIF) ranged between 1 and 2.5, well within the cutoff of 10 recommended by Neter et al. (1985).

The moderating effect of JCP on the relationship between partner-specific IT investments and SCCSs use was assessed using the three regression equations. In Eq. (1), the independent variable was partner-specific IT investments, in Eq. (2) the independent variables were: partner-specific IT investments, as well as JCP, and in Eq. (3) the independent variables were: partner-specific IT investments, JCP as well as the cross product of partner-specific IT investments and JCP. The results of the three regression analyses are given in Table 5a. The values of the coefficients generated by the three equations show that JCP is not a moderator as the coefficient of the interaction term in Eq. (3) is not significant (Standardized $\beta = 0.065$, $p = 0.369$). Hence, H3 is not supported.

The moderating effect of JCP on the relationship between SCCSs use and operational benefits was also assessed using the three regression equations. The results of the three regression analyses are given in Table 5b. The values of the coefficients generated by the three equations show that JCP is a true moderator. Indeed, the interaction effect in Eq. (3) is significant (Standardized $\beta = 0.395$, $p = 0.014$) while the direct effect of JCP in Eq. (2) is not significant (Standardized $\beta = 0.025$,

Table 5a
Moderated regression analysis with SCCSs use as the dependent variable.

Variables	Eq. (1)			Eq. (2)			Eq. (3)		
	Stand. β	t-Value	p-Value	Stand. β	t-Value	p-Value	Stand. β	t-Value	p-Value
Partner-specific IT investments[a]	0.270	1.563	0.064	0.227	1.561	0.065	0.188	1.003	0.162
Joint collaborative planning				0.574	3.759	<0.001	0.565	3.585	<0.001
Partner-specific investments × joint collaborative planning							0.065	0.337	0.369
R^{2a}	0.11, $p = 0.088$			0.37, $p = 0.001$			0.38, $p = 0.003$		
Delta R^2 [a]				0.27, $p = 0.001$			0.002, $p = 0.739$		

[a] p = level of significance based on a chi-square distribution $^{*}p < .10$, $^{**}p < .05$, $^{***}p < .01$, $^{****}p < .001$.

$p = 0.465$). The degree of interaction effect was plotted using the method suggested by Aiken and West (1991). Fig. 3 illustrates that at higher values of JCP, SCCSs use leads to greater operational benefits providing support for H4a. Overall, the results imply that JCP moderates the impact of SCCSs use on operational benefits.

The moderating effect of JCP on the relationship between SCCSs use and strategic benefits was also assessed using the three regression equations. The results of the three regression analyses are given in Table 5c. The values of the coefficients

Table 5b
Moderated regression analysis with operational benefits as the dependent variable.

Variables	Eq. (1)			Eq. (2)			Eq. (3)		
	Stand. β	t-Value	p-Value	Stand. β	t-Value	p-Value	Stand. β	t-Value	p-Value
SCCSs use	0.362	2.056	0.025	0.343	1.239	0.113	0.427	1.649	0.056
Joint collaborative planning				0.025	0.090	0.465	0.009	0.036	0.486
SCCSs use × joint collaborative planning							0.395	2.337	0.014
R^2 [a]	0.14, $p = 0.049$			0.15, $p = 0.149$			0.31, $p = 0.027$		
Delta R^2 [a]				0.01, $p = 0.923$			0.16, $p = 0.018$		

[a] p = level of significance based on a chi-square distribution. $^{*}p < .10$, $^{**}p < .05$, $^{***}p < .01$, $^{****}p < .001$.

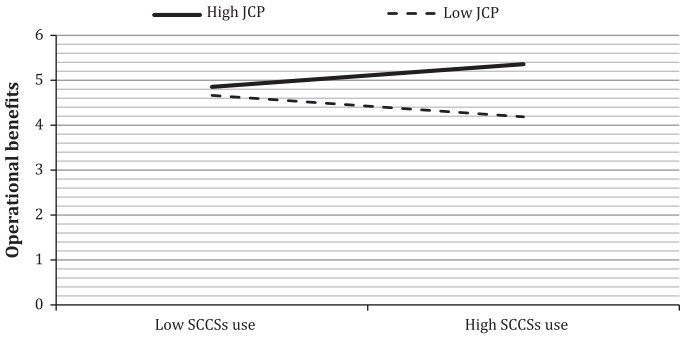

Fig. 3. Moderating effect of JCP on the relationship between SCCSs use and operational benefits.

Table 5c
Moderated regression analysis with strategic benefits as the dependent variable.

Variables	Eq. (1)			Eq. (2)			Eq. (3)		
	Stand. β	t-Value	p-Value	Stand. β	t-Value	p-Value	Stand. β	t-Value	p-Value
SCCSs use	0.690	5.220	0.000	0.436	2.374	0.012	0.434	2.316	0.014
Joint collaborative planning				0.350	1.903	0.034	0.347	1.854	0.037
SCCSs use × joint collaborative planning							0.236	1.690	0.051
R^{2a}	0.41, $p = 0.000$			0.46, $p = 0.000$			0.59, $p = 0.032$		
Delta R^{2a}				0.18, $p = 0.067$			0.13, $p = 0.027$		

[a] p = level of significance based on a chi-square distribution. $^{*}p < .10$, $^{**}p < .05$, $^{***}p < .01$, $^{****}p < .001$.

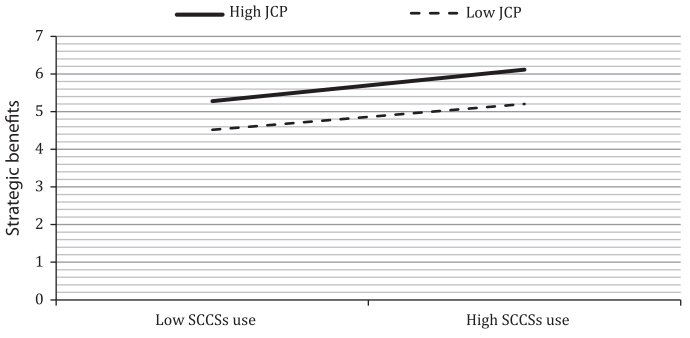

Fig. 4. Moderating effect of JCP on the relationship between SCCSs use and strategic benefits.

generated by the three equations show that JCP is not a true moderator but a quasi moderator. Indeed, both the interaction effect in Eq. (3) and the direct effect of JCP in Eq. (2) are significant (Standardized $\beta = 0.236$ with $p = 0.051$ and Standardized $\beta = 0.350$ with $p = 0.034$ respectively). Fig. 4 that at higher values of JCP, SCCSs use leads to greater strategic benefits providing support for H4b. Overall, these results imply that greater JCP directly impacts strategic benefits as well as moderates the impact of SCCSs use on strategic benefits.

6. Discussion

We draw upon the relational view of the firm to investigate the chain of IT-based co-creation of value in collaborative relationships and examine how JCP can moderate this chain of IT value creation. We first demonstrate that the greater the partner-specific IT investments made by the firm, the greater its use of SCCSs with those partners. Indeed, SCCSs use can generate relational rents, but to be able to generate these rents relation-specific investments are required to tailor the interorganizational systems to support the particular needs of each collaboration (Klein and Rai, 2009; Malhotra et al., 2005).

Second, we demonstrate that the greater the firm's SCCSs use with partners, the greater its operational and strategic benefits. Indeed, SCCSs use fosters the co-creation of value that provides both operational and strategic benefits to the firm by means of interfirm relation-specific assets, interfirm knowledge sharing routines and complementary resource endowments (Kim et al., 2011; Klein and Rai, 2009; Rosenzweig, 2009). This finding also indicates that SCCSs use has a stronger impact on strategic benefits than on operational benefits suggesting that interorganizational collaborative systems are critical interfirm resources that can generate rents and hence provide a lasting competitive advantage to the partners involved. In today's highly competitive and global market, where it is extremely difficult for an individual manufacturer to satisfy customer needs (Gunasekaran, 2001), this result is particularly important since the use of SCCSs to co-create value permits each supply chain partner to reap both operational and strategic benefits while simultaneously satisfying customer needs and securing gains against competing supply networks. Taking the perspective of the supplier, this finding also shows that SCCSs use provides a key advantage to suppliers when dealing with their downstream supply chain partners. Indeed, in an industrial context where manufacturers have reduced their supplier base from a wide range of different suppliers to a smaller set of suppliers, which are treated as partners (Clemons et al., 1993; Sanchez and Pérez, 2005), suppliers can both create value and retain a bigger portion of the value created by the use of SCCSs (Subramani, 2004) that will compensate or even surpass the benefits they reaped in the past when they were mainly engaged in spot market transactions with large pools of manufacturers.

To examine the chain of IT-based co-creation of value further, a post-hoc analysis was conducted to examine whether SCCSs use mediates the relationship between partner-specific IT investments and firm benefits. As reported in Table 6, both condition 1 and condition 4 proposed by Baron and Kenny (1986) to establish mediation are not supported. Hence, SCCSs use does not mediate the relationship between partner-specific IT investments and firm benefits because partner-specific IT is not a predictor of firm benefits. This analysis confirms the hypothesized chain of IT-based co-creation where IT investments encourage IT use which in turn creates business value.

Third, we demonstrate that (i) the relationship between the firm's use of SCCSs with partners and its operational benefits and (ii) the relationship between the firm's use of SCCSs with partners and its strategic benefits will be stronger when the firm conducts a higher level of joint collaborative planning with partners than when it conducts a lower level of joint collaborative planning with partners. This finding demonstrates that JCP, by fostering greater volume of exchange, greater partner-specific absorptive capacity, facilitating the alignment of incentives and increasing the compatibility in their

Table 6
Post-hoc analyses to examine whether SCCSs use mediates the relationship between partner-specific IT investments and firm benefits.

Variables	Standardized β	t-Value	P^{b}
Condition 1 to establish mediation proposed by Baron and Kenny (1986)			
Partnership-specific IT investments → operational benefits	0.090	0.710	NS
Partnership-specific IT investments → strategic benefits	0.098	1.093	NS
SCCSs use → operational benefits	0.426	4.562	****
SCCSs use → strategic benefits	0.714	12.684	****
Condition 4 to establish mediation proposed by Baron and Kenny (1986)			
Partnership-specific IT investments → SCCSs use	0.234	2.463	***
SCCSs use → operational benefits	0.391	4.659	****
Partnership-specific IT investments → operational benefits	0.033	0.995	NS
SCCSs use → strategic benefits	0.712	11.331	****
Partnership-specific IT investments → strategic benefits	0.060	1.076	NS

[a] Expressed as a natural logarithm in order to normalize the variable.
[b] p = level of one-tailed significance based on a chi-square distribution. $^{*}p < .10$, $^{**}p < .05$.
*** $p < .01$.
**** $p < .001$.

organizational systems, facilitates the generation of relational rents through the use of SCCSs. This result also clearly denotes that JCP is an important governance mechanism that should not only be used as a tool to improve the efficiency of collaborative processes but also be embraced as an initiative that can provide important strategic benefits. Our findings also show that when there is a low level of JCP, higher SCCSs use decreases the operational benefits of the firm (Fig. 3). This interesting result may be explained by the fact that in such a context an increase in SCCSs use requires more resources that in turn will diminish operational benefits. Hence, to reap the operational benefits tied to the use of SCCSs, a firm is required to increase its level of JCP with partners.

Contrary to what we hypothesized, our findings do not demonstrate that the relationship between the firm's partner-specific IT investments and its use of SCCSs with partners will be stronger when the firm conducts a higher level of joint collaborative planning with partners than when it conducts a lower level of joint collaborative planning with partners. This finding is surprising. One possible explanation may rest in the fact that partners do not detail enough their SCCSs requirements and/or are not familiar enough with their respective IT resources and capabilities when discussing and assigning the competencies and systems to the collaboration. More data is required to better understand the relationship between these three variables.

Additionally to the hypothesized relationships, we also demonstrate that JCP is positively and significantly correlated to SCCSs use, operational benefits and strategic benefits while the relationship between JCP and partner-specific IT investments is not significant (Table 4). This finding demonstrates that JCP is a powerful governance mechanism in the co-creation of IT value. Indeed, besides permitting the creation of relational rents that improve firm performance, JCP also fosters the use of SCCSs without requiring more partner-specific IT investments to do so. This particularity of JCP renders the usage of the governance mechanism the more interesting for supply chain partners.

6.1. Theoretical contributions and management implications

This research contributes to the existing literature in several ways. First, by focusing on the emerging reality of value co-creation, this study is amongst the first to contribute to a key new research direction in IT valuation research. Indeed, while prior research on IT value has mostly viewed IT value from the perspective of a single firm with the premise that IT investments in a single firm leads to value to that firm (Kohli and Grover, 2008), this study demonstrates that IT value can be created and realized through actions of multiple parties. Second, despite Devaraj and Kholi's (2003) results that have demonstrated the driver of IT impact is not the investment in the technology, but the actual use of the technology, this research is amongst the very few studies to examine the chain of IT value creation where IT investment encourages IT use which in turn creates business value. Furthermore, this study proposes an answer to the IT literature on the paradox or the lack of impact of IT investment on performance (e.g., Hitt and Brynjolfsson, 1996; Porter, 2001; Vickery et al., 2003; Devaraj and Kohli, 2003) in the context of interorganizational relationships. Third, this research contributes to the literature by demonstrating that JCP is an important governance mechanism to safeguard asset-specific investments and improve the performance of business relationships. The new conceptualization we propose may encourage researchers to undertake more survey-based empirical studies as the literature is mainly focused on case-based studies (Danese, 2007; de Leeuw and Fransoo, 2009), which may increase the generalizability of the findings in the field. Last but not least, our work constitutes one of the first in the field of IS to draw upon the relational view to examine the chain of IT-based co-creation of value. This research is also the first in IS to demonstrate that JCP is an effective governance mechanism that can impact the other three possible sources of relational rents via the key sub-processes proposed by Dyer and Singh (1998).

This study also provides two important insights for managers. First, this study provides a sound reasoning to the chain of IT-based value co-creation that should encourage managers to make IT-based relation-specific investments to foster the exchange of idiosyncratic information and know-how between with their supply chain partners. Second, this research also emphasizes the importance of JCP to safeguard IT-based specific investments as well as reap operational and strategic benefits. Furthermore, when conducting JCP with partners, the use of SCCSs provides more strategic benefits than operational benefits. Hence, JCP is an essential tool for managers to maximize IT investments, improve the quality of their relationships as well as provide a competitive advantage to the supply chain as a whole.

6.2. Limitations and future research avenues

Our results suggest several avenues for future research. First, the research model was tested with data collected from a small sample, which evidently limits the scope of our findings. Our small sample also prevented us to use a subsampling approach to test the interaction effects predicted in H3 and H4. Hence, to improve the generalizability of our results, future work can further test the proposed model on a larger sample size comprised of firms from various industries. Second, this research does not consider the patterns of SCCSs use and their varying relationship with both types of benefits as proposed by Subramani (2004). Future work can hence extend the proposed model by capturing patterns of use and linking them to both types of benefits in a more comprehensive model. Third, the model does not assess the IT direct economic impact (e.g. ROI, COGS, inventory turnover). As emphasized by Kohli and Grover (2008), future work can extend the proposed model to assess the direct economic value of SCCSs as well as the indirect and intangible paths to economic value that can be influenced by these systems. Finally, the present study demonstrates that IT is instrumental in co-creating business value but assesses the benefits of this co-creation for only one partner. Hence, future research needs to expand to collect dyadic data

or, even better, expand the unit of analysis from the dyadic relationship to the business network (Straub et al., 2004; Tapscott et al., 2000) in order to yield insight into how network topologies and relational ties shape cooperative behaviors as well as the chain of IT-based co-creation of value. Unfortunately, adopting a business network approach offers significant difficulties as collecting and examining data expand exponentially with the inclusion of growing numbers of network participants (Iacobucci and Hopkins, 1992).

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