An Explorative Analysis of the Effects of Information and Communication Technologies and Inter-Organizational Relationships on Supply Chain Management Systems

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This paper explores in a supply chain context the influences that inter-organizational relationships have on the use of information and communication technology (ICT). In particular it analyzes the system use of the emergent patterns of supply chain management (SCM) by considering the underlying supported business processes. The research model was created for the study of the ICT usage patterns and has been applied through a detailed qualitative study conducted on the leading software distributor in Italy. The obtained results lead us to the conclusion that ICT usage emerges from the interaction of parties with available technologies.

Keywords: Interorganizational relationships, Information and Communication Technology, Supply Chain Management.

Introduction

The challenges posed by globalization are reshaping inter-firm relations. New forms of cooperation based on trust have emerged as new behaviors of interconnected firms are creating a gap between theories and observations (BarNir and Smith, 2002; Yamada, 2003; Bunduchi, 2005; Lavie, 2006). The need to contribute to the exploration of this gap is compelling within the supply chain research field as supply chain organization has increased in complexity and has become even more multi-actor (Hong, 2002). This multi-actor network increases the level of integration of different partners (e.g., social interdependence, duration, trust) both internally and externally because of information and communication technology (ICT) (Kumar et al., 1998; Medina-Garrido et al., 2005; Chi and Holsapple, 2005; Elgarah et al., 2005; Welker et al, 2008). ICT, in fact, enables better coordination, planning, and support for the inter-organizational relationship (IOR) within the supply chain. Thus, this article aims to extend the comprehension of the interplay between ICT and existing inter-organizational relationships in the supply chain. This subject is important for companies as it provides a better understanding of the value-creating process affecting the performance of a single company and the supply chain multi-actor network as a whole.

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In order to attain this objective we decided to develop our study on the basis of the information systems literature in which the inter-organizational dimension of ICT-supported relationships is addressed by inter-organizational information system (IOS) studies (Chi and Holsapple, 2005). This angle of analysis effectively allows us to explore emergent usage patterns of a supply chain management system (SCMS), which is a particular form of IOS (Subramani, 2004). SCMSs support the inter-organizational collaboration among supply chain partners in terms of decisions regarding procurement and suppliers, production, distribution, material, information, and cash flows (Swaminathan and Tayur, 2003). SCM system solutions aim to create value along the entire supply chain by improving work specialization, information sharing, quickness of response and performance (Chopra and Meindl, 2001; Tan, 2001; Cohen Kulp et al., 2004; Subramani, 2004; Welker et al., 2008).

This article is organized as follows: in section two we review the past literature on the effects of ICT on the IOR and discuss the relevance of the SCM system in this context. We then present our conceptual model in section three and propose the categorization of the emergent formative contexts as usage patterns of a SCMS, as advanced by Subramani (2004) and relate them to specific supply chain inter-organizational processes. Our conceptual model is then validated in section four through an explorative case study performed on the supply chain of a premier software and videogame distributor in Italy: Leader S.p.A. company. The choice of this particular case is determined by the fact that it provides the conditions to study ICT implementation among collaborating partners within a networked supply chain. The results we obtained provided additional indicators of the inter-organizational dimension that allowed us to advance in section five from a theoretical standpoint to the concept of inter-organizational misalignment. Moreover, the present research framework gives practitioners a tool to assess and check the alignment between the possible and effective uses of the SCM system on the basis of ICT characteristics and existing inter-organizational relationships.

Using ICT will enable better and more efficient links between retailers and suppliers to meet consumers’ need.

**Literature review**

**ICT is an essential support of IORs**

The study of IORs received contributions from multiple disciplines and the heterogeneity of contexts and times in which these were published are reflected in the proposed arguments adopting different models and underlying theories (Haugland, 1999; Yamada, 2003; Ritter and Gemünden, 2003). IORs are the various interactions that build up among several organizations. “The following characteristics of an inter-organizational relationship have been discovered leading our way to an understanding of industrial markets” (Ritter and Gemünden, 2003). In order to support our research framework we decided to focus in this vast body of knowledge, mainly on those studies summarizing the complexity of the IOR topic through “global” models, assessed in the literature through surveys or case studies. Therefore, Kern and Willcocks (2000) in their study of information technology outsourcing relationships performed an extensive survey of existing relationship approaches and reported that the information system literature was still inconclusive and that a further investigation into organization and marketing literature was needed.

More recently, different models have been trying to extend managerial theories such as the principal agency theory (Pavlou et al., 2007), the information processing theory (Premkumar et al., 2005), the structuration theory (Evans and Brooks, 2005), the resource-based view model (Bharadwaj, 2000), and the dynamic capabilities theory (Teece et al., 1997) by taking into consideration the contribution of information technologies to company performance (Pavlou, 2002; Subramani, 2004; Malhotra et al., 2005; Zaheer and Bell, 2005). However, despite the success of these contributions, the studies were unable to conceive an integrative view, each addressing different aspects of the inherent complexity of an IOR. Consequently, the assessment of ICT effects on the IOR is an active field because it can be seen from the multiple theoretical references adopted for their analysis.

In an extensive literature review, Dewett and Jones (2001) investigated the effects of ICT on organizational characteristics and results by studying the moderating and beneficial effects of information efficiencies and synergies (such as higher efficiency, organizational innovation, increased coordination, and collaboration). In term of ICT support on the IOR they found effects in three dimensions: strategic, information, and transaction. In particular, ICT use seems to be correlated to greater collaboration among partners because of its ability to effectively enable the collaboration process (Chi and Holsapple, 2005). Several studies support this assertion, such as Hossain and Wigand (2004), Ollus (2007) and Dibbern et al. (2009) suggesting a general agreement on the positive effects of ICT on collaboration.

However, a relative small number of cases that still remain controversial indicate the need to consider the
effects of social and organizational factors such as the trust between partners and the role played by people in building the relationships (Chae et al., 2005). An interesting contribution provided by Patnayakuni et al. (2006) confirmed the relevance of relational properties (asset specificity, interaction routines, and log-term orientation) in shaping the integration of information flows in coordinating the supply chain. As already observed by Chae et al., (2005) despite its relevant role, ICT alone does not fully explain inter-firm collaboration. The availability of the technological infrastructure facilitates and supports the collaboration effort and in some cases seems to effectively enable it. Nevertheless, the relationship at the base of the collaboration activities appears to affect how the infrastructure is employed.

However, in order to overcome the limits identified by Chae et al., (2005) and to specify an effective practice we developed the components of their conceptual model and propose an approach based on the practitioner’s view of the SC process. Moreover, we test the consistency of this approach to assess both relationships upstream and downstream of the supply chain. Finally, by detailing and providing instances of the formative context we aim to identify additional determinants of IOS use.

Supply chain management systems (SCMSs)-a particular form of IOS

“A supply chain is a network of suppliers, factories, warehouses, distribution centers, and retailers through which raw materials are acquired, transformed, produced, and delivered to the customer” (Barbuceanu and Fox, 1994). A SCMS manages the cooperation of these system components. The system has a server and a tracking database linked to multiple remote transaction sites (Fox et al., 2000). In effect, there is a particular IOS in place among buyers and sellers supporting typical supply chains process and activities (Lee et al., 1997). These systems play an essential role in supply chains representing the informational and technological support for all transactions. Organizations have long recognized that SCMSs, with their capacity to facilitate information flows across supply chains partners, have a key role in supporting SCM practices and processes as shown by their categorization offered in another study (Carter et al., 1995; Mukhopadhyay et al., 1995; Balsmeier and Voisin, 1996; Christopher, 1998; AIP, 2004).

Companies can develop close partnerships with other supply chain actors in the form of shared information streams to forecast, produce, assemble, and effect just-in-time creation to ship their products. The SCMS allows partners to access information on activities out of their direct control, facilitating not only the dyadic buyer-seller relationship but also the collaboration among the members of the network (Donlon and Galli, 1998; Eigarad et al., 2005). The SCMS enables companies to coordinate production with demand, to better manage logistics flows, to reduce inventory and cycle times, to improve customer satisfaction, and to reduce in general investments and costs (Lee et al., 1997; Lee, 2000; Mentzer, 2004). The SCMS increases the number of information channels that connect suppliers to customers, thus they are able to make decisions more quickly if accurate data are available (Carter et al., 1995; Cohen Kulp et al., 2003; Mentzer, 2004).

Thus, SCMSs play different roles of being an element of power in a relationship (Kumar & Van dissel, 1996), a source of latent conflict (Nagy, 2006), and also a source of innovation in terms of value creation (Fulconis et al., 2007). Despite some controversy in assessing the benefits of the SCMS, different studies reported positive outcomes from their use and adoption, which can be explained by higher integration levels (Craighead et al., 2006). However in this article we focus on the study of the influence of the formative context on SCMSs supported process more than on a definition of an information technologies capability supporting infrastructure integration for SCM (Rai et al., 2006). Moreover, its implementation has been showed to having no direct effect on supply chain performance; it contributes only indirectly through supply chain integration (Li et al., 2009). It is clear that Chae et al.’s model requires further specification.

Therefore, we can infer an important reflection on the influence of IORs on the use of SCMSs and the pivotal role they have in determining organizational performance:

RQ1. How do existing relationships among partners influence the use of the SCMS?

RQ2. Does the assessment of the inter-organizational relationship effectively provide a useful insight on emergent IOS use, as suggested in literature?

In order to address these questions we propose a model capable of assessing the moderating role of the IOR on SCMS use. The next section details the research framework and the methodology adopted.

Research framework

Conceptual model

The research framework is depicted in Figure 1. On the basis of both Chae et al.’s (2005) and Subramani’s works, we suggest this conceptual model for exploring the effects of the IOR and ICT on SCMS use and process. In particular, we argue that the emergent properties of the interplay of ICT and the IOR are reflected in the use of the SCMS-for “exploration and exploitation” (March, 1991) as suggested by Subramani (2004) -and the supply chain process it supports-as identified in previous studies (BarNir & Smith 2002).

We thus adapt both models and measures in order to address our research questions. The exploration of inter-
organizational collaboration is then performed on a composed, embedded factor: use pattern + supported process through a global approach that we advance.

Fig. 1. The conceptual model adapted from Chae et al. (2005) and Subramani (2004)

It is assumed, as reflected by the literature review, that the use of ICT among partners in a supply chain has an effect on collaboration by enabling and shaping it. Chae et al.’s (2005) conceptual model suggests that the ICT effect on the SCMS “is not predetermined by its technological capabilities. Rather its effect is . . . the emergent properties of the interplay between IT and existing relationships between partners”. Consequently, the study of ICT alone is argued to be insufficient to infer about the SCMS and that a similar understanding can be provided by characterizing the existing IOR.

In particular, Handfield and Bechte (2002), Chae et al. (2005) and more recently Palmatier et al. (2007) base their studies on several dimensions or perspectives of IOR performance: commitment-trust, interdependence and dependence asymmetry, long-term orientation (specific investments and opportunistic behaviors), relational norms (solidarity, mutuality, and flexibility), resources, capabilities, and information sharing. This composite factor is considered capable of gauging the level of collaboration. On the basis of multiple case studies in which they analyze five pairs of suppliers and retailers, the study demonstrates that the development of an IOS is the result of a socio-technical interaction and thus that partners’ formative contexts affect collaboration.

We further extend this conceptual model circumstantiating these formative contexts as usage patterns of the SCMS and the related supported supply chain processes. Subramani (2004) found evidence, based on a survey of 131 suppliers, that SCMS patterns contribute to the formation of the contexts in which suppliers make relational-specific investments, enabling value creation and retention. This assessment enables us to decline Chae et al.’s (2005) work categorizing and declining the formative context. Of particular interest is the fact that Subramani’s (2004) constructs and tested hypotheses are defined on the basis of the business process and activities characterizing relationships. Thus, and in accordance with other studies, the assessment of the inter-organizational process is suggested to be capable of categorizing the interplay between the technological (the available ICT used to support the relationship) and the relational dimension.

Construct measurement

We further detail here the different model components:

**Inter-organizational relationships.** IORs are qualitatively evaluated accordingly to the models proposed by Chae et al. Welker et al., (2008) and Palmatier et al. (2007) on the assessment of six dimensions, four of which are used to “gauge” the rating of collaboration: interdependence, long-term orientation, trust and information sharing.

We also added a new dimension, the duration of the relationship, as a control variable. Each component of this construct was measured using a five-point Likert scale (1-low, 2-medium-low, 3-medium, 4-medium-high, 5-high) derived from the agreement on interviewees' subjective ratings and specific examples:

- **Interdependence:** representing the degree of dependence on the relationship of profit and sales volume and the availability of alternative suppliers (Welker et al., 2008; Palmatier et al., 2007). Interdependence was evaluated on the basis of the level of business dependence between publisher-distributor and distributor-retailer.
- **Long-term orientation:** evaluating the resource investment and the top management commitment to and support of the relationship (Welker et al., 2008; Palmatier et al., 2007). Interdependence was evaluated on the basis of the level of business dependence between publisher-distributor and distributor-retailer.
- **Trust:** rating each partner for its assessment or benefits and risk sharing, reliability, and benevolence (Welker et al., 2008; Palmatier et al., 2007). The
evaluation of trust was based on interview ratings regarding partners’ benevolence, credibility, and detailed precontractual and contractual supplier assessment.

• **Information sharing**: based on the assessment of the quantity, quality, and typology of information shared and on the systems adopted to communicate with the company leader and the conflict resolution techniques (Handfield & Bechte, 2002).

• **Collaboration**: Lawrence et al. (2002) distinguish “collaboration from IOR that are cooperative, but in which cooperation is neither purchased (as in a supplier relationship) or based on some form of legitimate authority. The distinction is critical because collaboration tends to effect change in institutional fields in a different way than markets and hierarchies”. The collaboration activities performed were assessed on the basis of staff evaluation and through specific examples of collaborative activities (i.e. problem solving, promotion campaigning, displaying design, joint planning, forecasting, performing a vendor-managed inventory [VMI], and managing a category). Problem solving and promotion are considered “primitive” collaboration areas whereas VMI and category management are seen as “extensive”.

• **Duration of the relationship with the company leader**: This dimension was evaluated by the duration of the contract (Handfield & Bechte, 2002).

**Inter-organizational ICT characteristics** were rated by identifying the systems in use to support the SC relationship (fax, e-mail, Web, XML, EDI, FTP, or proprietary systems) and referring to the capacity of the partner and its system to support supply chain activities such as stocks, warehousing, or order management (Chae et al., 2005).

**Patterns of SCMS use**. Subramani (2004) studied SCMS patterns of use based on March’s (1991) categorization of organization actions being either exploiting or exploring based on the appropriation of supply chain technologies (DeSanctis & Poole, 1994). These concepts were then linked to the degree of structuration of interfirm processes-structured and unstructured-and the different goals and outcomes characterization of systems’ uses. **Exploitation** is then directed towards the improvement, application, and incremental refining of firm capabilities and generates definable benefits, whereas **exploration** aims to create new capabilities and novel solutions to current problems resulting in difficult-to-evaluate soft benefits (Subramani, 2004). A similar dichotomous classification is often found in SCM literature (Eng, 2004), and a comparable approach is adopted in two other studies regarding ICT-supported B2B practices in Italy (Michelino et al., 2008).

**Supported SC process.** The original work of AIP (2004) referred to the operational and collaborative nature of inter-firm processes and proposed to classify nine main supply chain processes into two broad categories of supply chain execution (aimed at the automation and optimization of buyer-seller interface processes) and collaboration processes (aimed at process empowerment through information and know-how sharing and the collaboration on decisional or executive phases):

**Supply chain execution**
1. Before selling
2. Order release
3. Logistics
4. Administrative and accountant
5. After selling

**Supply chain collaboration**
6. Monitoring and control
7. Planning
8. New product development
9. Marketing

These works are used to define the patterns of the SCMS as either exploration or exploitation and the current SCMS-supported processes.

**SCM use and SC process.** We assessed the use of the SCMS based on the relationship between exploitation and exploration patterns with, respectively, supply chain execution and supply chain collaboration process. Organizations were considered having a certain pattern of collaboration depending on the process supported by the SCMS. Moreover, we in turn expect that ICT will be deployed according to the pattern of SCMS use (with reference to our first research question).

**Research design**

The research design consists of a case study conducted in Italy with the support of the Leader S.p.A. Company, one of the largest software distributors in the country. The case study methodology was found appropriate because it allows researchers to investigate “a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident,” (Yin, 1994) a typical occurrence in studies dealing with inter-organizational issues. Further, case studies can deepen the understanding of the object of analysis (the company) and provide the opportunity to gain knowledge not only on the downstream of the supply chain, but also to study at the same time both customers’ and suppliers’ relationships with the focal company. Moreover, case studies are accepted in inter-organizational SCM research (Hilmola et al., 2005) and well suited to answering research questions dealing with “why” and “how” certain phenomenon occur (Yin, 1994).

**Data collection**

The data collected for this study are a part of a broader study REGINS-RFid performed to assess RFId feasibility in Leader’s supply chain and funded by the European Union under the REGINS-INTERREG IIIIC program. The interest in studying the Leader Company is twofold. On the one hand, the
company acts with the typical business model of a distributor intermediating suppliers and points of sale, a business that typically leverages relational aspects in order to be performed (Earle and Keen, 2000). On the other hand, the software industry is a natural habitat for IT-supported transactions, thus we expected that the companies analyzed were not limited by their capabilities to manage or exploit technologies. This would then result in a clearer picture of the influence that the characteristics of the relationship exert on the emergent SCMS use.

Data were collected from January to March 2006. Two main phases were followed in order to gather the data. At first a researcher spent four months within Leader S.p.A. in order to study their inter-organizational processes and to assess the interaction of the different systems supporting the inter-organizational relationships. This provided a first assessment for the following series of interviews with many key informants to gather the required information. Thus, two methods of data gathering were employed: interactive semi-structured interviews with key informants (the logistics manager, the operations manager, the chief information officer, the chief executive officer, and the key account managers of Leader’s main partners to double check the consistencies of the answers of the top executives) and documentation and business records analysis that Leader S.p.A. had made available to the research group (supplier and customer transaction volumes and ratings).

The interviews lasted from 30 minutes to more than 1h 30 minutes, took place at the Leader S.p.A. premises, and were conducted by the first researcher and then eventually with the senior researcher when interviewing the CEO and the CIO. The respondents were asked to describe with examples the investigated dimensions and finally to rate the various dimensions specified in the model and detailed in the next section. On several occasions follow-ups were requested to comment on the data gathered and on the expressed evaluation to confirm interviewer interpretation of respondent answers and the quality of the data. The interviews were used to evaluate the different constructs of the model. The evaluation of the model constructs was considered reliable because the answers provided from the several informants interviewed converged despite the different details given due to the specific area of competence. A database was built in order to analyze the answers that were classified on qualitative ranges. A synthesis of the ratings and evaluations obtained during the interviews is proposed in the Appendix, where we tried to highlight the main concepts emerging from the narratives.

Finally, the patterns of SCMS use and the supported processes were determined by evaluating the available data and through follow-ups with Leader’s staff. In particular, the interviews with the logistic and operation managers allowed for a very detailed analysis of the inter-organizational processes in place with the different partners of the company. This enabled the formalization of the business process (we adopted the Unified Modeling Language activity diagrams) and a direct comparison, by interviewing the CIO, of the technological support that the company had in place. The interviews with the other executives provided the basis for the assessment of the relational dimension.

**Case setting**

Leader S.p.A. was founded in 1984 as a company specializing in the release, localization, and distribution of PC and console software. From the beginning, the quality of the customer service and the relationship with its suppliers-software publishers-have been key points of success. Leader’s partners are famous international publishers such as Eidos Interactive, Activision Italia, Microsoft Manufacturing, Electronic Arts Italia, and Sega Europe. Leader’s relationship with publishers has strengthened over time, surmounting technological and market evolutions, allowing Leader S.p.A. to reach almost 50 percent of the market share for PC software in Italy.

Leader S.p.A. has devoted a lot of effort to the pursuit of an Internet strategy developing ICT-based services for their partners. Through the business portal www.leaderspa.it the company provided access to their partners all the information available in company’s information system, for example, general information on the product, product specifications, the reviews of specialized presses, the available stocks, the back order, the receipts emitted, the customer’s account balance, the shipment tracking, the revenue, and the products in store per individual publisher.

Leader S.p.A. has more than fifty suppliers and a large number of heterogeneous customers—from large retailers to small shops. For the aims of this study only Leader’s main suppliers and customers were selected because they represent the ideal targets of advanced collaborative efforts. Another reason to focus on larger publishers is that they are perceived as critical strategic resources because they tend to deal directly with large retailers, de facto, dis-intermediating Leader S.p.A. The analyzed relationships involved suppliers of the calibre of Microsoft Interactive, Sony Computer Entertainment, Electronic Arts Italia, Activision Italia, Eidos Interactive, Sega European Limited, Midway Games, Empire Interactive Europe, Editorial Planeta De Agostini, FX Interactive, and large retailers such as Auchan, Carrefour, CDC, Coop, EB Italy, Finiper, Fnac, Mediaroom, and Db-Line, which is actually a wholesaler.

**Description of IOR and ICT characteristics on the SCMS and use patterns**

By describing the different components of the proposed
research model we will show the existence of the postulated link between the IOR and ICT characteristics and the collaboration pattern among partners.

The collaboration with partners was generally medium-low, testifying to the lack of available and consolidated procedures for an effective coordination with both customers and suppliers. At the time of the study, none of the companies was involved in extensive collaboration activities and display design; joint planning and forecasting were the most advanced and performed activities. Only with Db-Line was an auto-replenish system of the main products projected to be put into place.

Leader’s staff ratings were based mainly on the level of involvement that the company has respectively at the launch of a title (the game) with publishers and in the planning, assortment, and stocking of products with customers. Based on the interviews it was then possible to identify in Sega, Midway, Empire, De Agostini, and FX close partner publishers and in CDC, Db-Line, EB Italy, Fnac, and Mediaworld the close customers: in other words, collaboration is greater with consumer electronics retailers. Furthermore it was possible to observe a negative relation between the market relevance of a publisher and the collaboration with Leader, emphasizing the fact that larger players tend to directly manage a large part of the promotion, forecasting, and planning and tend to rely on distributors to cover the part of the market composed by small points of sale.

The general interdependence level is high for publishers and medium-high for customers, reflecting the turnover composition in which small points of sale contribute to around 50 percent of total sales. Leader’s staff rated large publishers such as EA and Activison with only an average interdependence level because despite their relevance in terms of generated revenues, they could approach the market through alternative channels. In particular, Microsoft (a long-standing partner) is one of the most important publishers in the market and despite low level of collaboration, as previously defined, presents a relationship with a high degree of interdependence. Leader has great interest in Microsoft’s partnership because their products constitute a large portion of the market and at the same time Microsoft prefers Leader to distribute their products towards small and medium-sized points of sale. Sony is in a similar position but it had just only recently started distributing through Leader and thus the interdependence is still low.

Because of the relevance that the analyzed partners have for Leader S.p.A., the company’s commitment to long-term collaboration is always very strong and top management is always seeking new ways to offer and improve its services to both publishers and customers. Because of this, VMI solutions have been under study for years but have not been implemented yet. Otherwise, larger general retailers such as Finiper or Carrefour are actually moving towards direct interaction with larger publishers thus hampering long-term orientation.

Leader’s trust in publishers is generally medium and medium-high because for the most part trust is always built, as the company states, “on paper contracts”. However, only rarely were contract terms breached or partially fulfilled. Leader S.p.A Company poses the highest degree of trust in Microsoft, Sony, and FX, accepting risks on the whole stock of products distributed. Similarly, problems with customers have rarely arisen (retards on payments and minor issues on contract terms) and generally occur with general retailers.

Information sharing on order management is dealt through account managers or directly by the top management dealing with partners and through agents with retailers, but only once a distribution agreement is reached. Top management meets frequently and conference calls are held to ensure the sharing of vision on promotional campaigns, inventory, and payment information, implying a strategic dimension of the collaboration. Information exchange is further supported by real-time information through reciprocal access to intranet data. Conversely, retailers could provide additional market data-exchanging information on sales and competing products figures in face-to-face representatives’ visits (i.e., Mediaworld and Fnac). However, some large retailers’ point-of-sale information is not centrally managed or is exchanged directly at POS level (i.e., Coop and Carrefour).

In terms of ICT characteristics, all partners have access to Leader’s website to manage their accounts and in past years have asked Leader S.p.A. to customize and develop their dedicated area. Larger publishers (i.e., EA and Sony) exchange information on orders, administration, and control other than via the website through the direct XML data exchange for order release. Exclusively for Microsoft, Leader has interfaced its system with MSOps (Microsoft Worldwide Operations), actually providing total access to their data. On the customers’ side, some of them are starting to adopt XML, whereas some major retailers are still using EDI (Electronic Data Interchange)-based systems (i.e., Finiper and Carrefour). Agents visiting retailers directly collect orders electronically and can immediately transfer them into Leader’s IS: in usual circumstances, an order can be processed and made ready for delivery in around fifteen minutes. An expected strong difference is observed between publisher and retailer ICT support as publishers are obviously mastering ICT whereas retailers are lagging behind because they lack interoperable—the majority of them do not even provide an access-and centralized systems (Carrefour and Coop).
Discussion of ICT effects on collaboration and the emergent patterns of SCMS use

The research model was developed to answer the main research questions.

RQ1. How do existing relationships among partners influence the use of the SCMS?
To study the influence on collaboration of ICT we analyzed the emergent use of the inter-organizational system. The joint analysis of ICT characteristics and the strength of the relationship showed a positive link (see Figure 1). This result confirms Chae et al.’s (2005) findings that the existing relationship can affect ICT use in the supply chain. Low levels of information shared, trust, or interdependence resulted in low ICT exploitation in supporting the IOR (i.e., Coop and Finiper) and, at the same time, strong relationships were generally associated with advanced ICT use (i.e., Microsoft and FX).

However, this conclusion seems to highlight two limiting factors. On the one hand, publishers show high ICT characteristics and possess strong competences to support the relationship, but it was observed that in terms of the SCMS the actual systems tend to support only SC execution processes, whereas collaboration ones are limited to monitoring and controlling inter-organizational processes. This typical exploitation behavior contrasts with Leader’s willingness to scale the use of the SCMS towards more collaborative patterns. A possible explanation is that SCMS use for exploration and exploitation is limited by the interplay of the scopes or of the aims of partners more than from the capabilities of the collaborative system. Thus, ICT may stabilize cooperative behaviors, but “not necessarily increase the level of inter-organizational collaboration per se” (Chae et al., 2005) and, as shown by this study, the use of features available in the system.

On the other side, low ICT characteristics of one member of the party could greatly limit the use of advanced features of the SCMS despite strong relationships, even if such features were made available by Leader or considered valuable by the partner thus hindering the emerging relationship of collaboration, as the retailers’ analysis has demonstrated.

RQ2. Does the assessment of the inter-organizational relationship effectively provide a useful insight on emergent IOS use, as suggested in literature?
Even in presence of a close relationship among partners the IOS use was similar across the sample. From the case study we observed a general under usage of the capabilities of the system. Partners were interested in the exploitation of the system and in the support of the operative and transaction-related process. A strong correlation between the relationship and IOS use would have implied a more explorative and collaborative use of the SCMS in the presence of close relationships.

Figure 2 details the joint analysis of ICT characteristics (level of inter-organizational system use), the strength of the relationship (sum of the variables of inter-organizational relationship), and the relative size of the partner on the base of Leader’s turnover (n = 20).

Companies using ICT as a tool to pursue their competitive strategy appear capable of better articulating their technology and their organization when they are oriented towards external and internal relationships. Consequently, usage strategies are strongly related to the organizational capabilities developed by the company. The established relationship between usage strategies and technology allows the understanding of the strategic coherence of the technological configuration and internal and external usages. Further research efforts could explore the dynamic nature of the identified factors (both theoretical and identified in practice); the history behind a relationship effectively builds and frames its context and could be used to provide an interpretation of the observed usages.

Finally, this article highlights the concept of inter-organizational misalignment and provides some useful indications for practitioners.
The establishing of ICT-supported relationships between a distributor and its suppliers and customers could successfully affect the development of the IOS. It could advance distributor systems and involve its collaborative partners into the innovative use of the available technology. Moreover, both companies and supporting IOS have to account for the context in which the relationship emerged (e.g., industry or sector rules, existing contracts, standards, and the results of previous interactions among partners). This analysis would provide a better understanding of the experience and environment of usage even in terms of the “social network” a company belongs to.

Conclusions

The increasing role of inter-organizational relationships in shaping today’s competition has increased the need for both practitioners and researchers to gain a deeper understanding of the potentials of ICT in supporting value creation in supply chains. This article aimed at exploring the influences that inter-organizational relationships have on the use of ICT in this context. The objective was to frame appropriate dimensions of the relationship and assess their relevance in influencing ICT emerging usage patterns. We actually confirmed that relational specific attributes, as specified in the research model, can explain the ICT characteristics in a supply chain.

In fact, a positive link between these two aspects was observed in the proposed case study. In that sense we supported the claim that ICT use appears to be correlated to greater collaboration among partners reflected in the support of several collaboration processes. [9, 30-32] However, the interplay of scopes and aims of partners and the deficiencies of ICT characteristics constituted important limiting factors to the empowerment of the collaboration efforts. We effectively highlighted that what ICT “put” into an inter-organizational collaborative relationship, although positively correlated with the strength of the relationship, is itself limited by factors not directly related to the relationship but on the formative context that emerges from the interplay of the partners.

On one side, we showed that a certain level of IT capabilities is necessary to commit resources to more explorative use of the technological infrastructure, enabling more complex collaborative processes to be performed. On the other, the patterns of use of the system shaped by the interaction of partners appears limited more by contextual factors than by the capabilities of the collaborative system, thus not increasing automatically the level of inter-organizational collaboration (Chae et al., 2005) or the use of advanced features made available from the system. It is then clear that the availability of neither the technology nor the established relationship is sufficient to account alone for the success of supply chain collaboration practices.

This approach has then provided a more detailed description of the formative context than previous studies (Ritter & Gemünden, 2003; Chae et al., 2005; Patnayakuni et al., 2006; Michelino et al., 2008). Further, we effectively observed several inter-organizational system usage patterns associated with customers and suppliers and partially related to ICT characteristics. This appears to reinforce early observations that in dealing with inter-organizational relationships some specificities should be accounted for and that general approaches are probably limiting the possible exploitation of the real potential of the collaboration.

However, this study is still limited on two main aspects. First of all, the explorative and case-based nature of the research limits the generalizability of the findings and the results could then suffer from the possible bias of an analysis centered on only one, country-specific company. The evaluation of the relevant construct of the model was subjective and based on the point of view of the informants thus possibly not reflecting the opinions of Leader’s partners. Second, although validated in the literature, the model could account for others when characterizing the relationship and elements of bargain power, appropriateness of the benefits, cost sharing among partners should be further explored.

Finally, the model lacks any consideration of performance or business value. Are these ICT-supported relationships providing value to the participating firms? How is this value evaluated and appropriated? Do ICT inter-organizational capabilities influence this value-creation process? The understanding of how value is created by means of ICT in the inter-organizational context is surely an interesting research theme worth future exploration.

In summary, this study clearly showed the limited use of ICT in supporting more complex inter-organizational collaboration tasks. Technological capabilities were available on both sides, the focal company was willing to scale its effort, but the emergent pattern of SCMS use showed an exploitation of the system. This actually represents a sort of inter-organizational misalignment between the possible and effective uses of the SCMS based on ICT characteristics and existing relationships. A greater understanding of the determinants of this misalignment—apparently unrelated to the ICT capabilities of the partners or to relational factors—constitutes a possible track to further extend this research. And, despite the highlighted limitations and explorative nature of this work, we actually provided validation for Chae et al.’s (2005) early findings and extended the characterization of the usage patterns to actual system use better relating and specifying the relational and technological interplay when characterizing inter-organizational collaboration.
References


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About the authors

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### Table 1: Relationship between a leader and its main suppliers

<table>
<thead>
<tr>
<th>Publisher</th>
<th>Collaboration</th>
<th>Interdependence</th>
<th>Long-term orientation</th>
<th>Trust</th>
<th>Information sharing</th>
<th>Aims</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microsoft</td>
<td>Supply chain management</td>
<td>Strong</td>
<td>Mutual accountability</td>
<td>High</td>
<td>Both focuses on building long-term relationships</td>
<td>Market-oriented strategies for increased market share</td>
<td>5 years</td>
</tr>
<tr>
<td>Sony</td>
<td>Supply chain management</td>
<td>Medium</td>
<td>Mutual accountability</td>
<td>High</td>
<td>Focus is on building long-term relationships</td>
<td>Increase ADR and customer satisfaction</td>
<td>3 years</td>
</tr>
<tr>
<td>Electronic</td>
<td>Supply chain management</td>
<td>High</td>
<td>Mutual accountability</td>
<td>High</td>
<td>Focus is on building long-term relationships</td>
<td>Market-oriented strategies for increased market share</td>
<td>5 years</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>Supply chain management</td>
<td>High</td>
<td>Mutual accountability</td>
<td>High</td>
<td>Focus is on building long-term relationships</td>
<td>Market-oriented strategies for increased market share</td>
<td>5 years</td>
</tr>
<tr>
<td>LG</td>
<td>Supply chain management</td>
<td>High</td>
<td>Mutual accountability</td>
<td>High</td>
<td>Focus is on building long-term relationships</td>
<td>Market-oriented strategies for increased market share</td>
<td>5 years</td>
</tr>
<tr>
<td>Intel</td>
<td>Supply chain management</td>
<td>Medium</td>
<td>Mutual accountability</td>
<td>High</td>
<td>Focus is on building long-term relationships</td>
<td>Market-oriented strategies for increased market share</td>
<td>5 years</td>
</tr>
<tr>
<td>Motorola</td>
<td>Supply chain management</td>
<td>Medium</td>
<td>Mutual accountability</td>
<td>High</td>
<td>Focus is on building long-term relationships</td>
<td>Market-oriented strategies for increased market share</td>
<td>5 years</td>
</tr>
<tr>
<td>Canon</td>
<td>Supply chain management</td>
<td>Medium</td>
<td>Mutual accountability</td>
<td>High</td>
<td>Focus is on building long-term relationships</td>
<td>Market-oriented strategies for increased market share</td>
<td>5 years</td>
</tr>
<tr>
<td>GE</td>
<td>Supply chain management</td>
<td>Strong</td>
<td>Mutual accountability</td>
<td>High</td>
<td>Focus is on building long-term relationships</td>
<td>Market-oriented strategies for increased market share</td>
<td>5 years</td>
</tr>
</tbody>
</table>

### Table 2: Relationship between a leader and its main customers

<table>
<thead>
<tr>
<th>Point Of Sale</th>
<th>Collaboration</th>
<th>Interdependence</th>
<th>Long-term orientation</th>
<th>Trust</th>
<th>Information sharing</th>
<th>Aims</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midwestival</td>
<td>Supply chain</td>
<td>Strong</td>
<td>Mutual accountability</td>
<td>High</td>
<td>Focus is on building long-term relationships</td>
<td>Increase market share</td>
<td>3 years</td>
</tr>
<tr>
<td>Okawa</td>
<td>Supply chain</td>
<td>Medium</td>
<td>Mutual accountability</td>
<td>High</td>
<td>Focus is on building long-term relationships</td>
<td>Increase market share</td>
<td>3 years</td>
</tr>
<tr>
<td>Hanada</td>
<td>Supply chain</td>
<td>Medium</td>
<td>Mutual accountability</td>
<td>High</td>
<td>Focus is on building long-term relationships</td>
<td>Increase market share</td>
<td>3 years</td>
</tr>
<tr>
<td>Fuegi</td>
<td>Supply chain</td>
<td>Medium</td>
<td>Mutual accountability</td>
<td>High</td>
<td>Focus is on building long-term relationships</td>
<td>Increase market share</td>
<td>3 years</td>
</tr>
<tr>
<td>Gaozi</td>
<td>Supply chain</td>
<td>Medium</td>
<td>Mutual accountability</td>
<td>High</td>
<td>Focus is on building long-term relationships</td>
<td>Increase market share</td>
<td>3 years</td>
</tr>
<tr>
<td>Echitaly</td>
<td>Supply chain</td>
<td>Medium</td>
<td>Mutual accountability</td>
<td>High</td>
<td>Focus is on building long-term relationships</td>
<td>Increase market share</td>
<td>3 years</td>
</tr>
<tr>
<td>Carrefour</td>
<td>Supply chain</td>
<td>Medium</td>
<td>Mutual accountability</td>
<td>High</td>
<td>Focus is on building long-term relationships</td>
<td>Increase market share</td>
<td>3 years</td>
</tr>
<tr>
<td>Wii</td>
<td>Supply chain</td>
<td>Medium</td>
<td>Mutual accountability</td>
<td>High</td>
<td>Focus is on building long-term relationships</td>
<td>Increase market share</td>
<td>3 years</td>
</tr>
<tr>
<td>Acer</td>
<td>Supply chain</td>
<td>Medium</td>
<td>Mutual accountability</td>
<td>High</td>
<td>Focus is on building long-term relationships</td>
<td>Increase market share</td>
<td>3 years</td>
</tr>
<tr>
<td>Sony</td>
<td>Supply chain</td>
<td>Strong</td>
<td>Mutual accountability</td>
<td>High</td>
<td>Focus is on building long-term relationships</td>
<td>Increase market share</td>
<td>3 years</td>
</tr>
<tr>
<td>Electronic</td>
<td>Supply chain</td>
<td>Strong</td>
<td>Mutual accountability</td>
<td>High</td>
<td>Focus is on building long-term relationships</td>
<td>Increase market share</td>
<td>3 years</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>Supply chain</td>
<td>Strong</td>
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<td>High</td>
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<td>Increase market share</td>
<td>3 years</td>
</tr>
<tr>
<td>LG</td>
<td>Supply chain</td>
<td>Strong</td>
<td>Mutual accountability</td>
<td>High</td>
<td>Focus is on building long-term relationships</td>
<td>Increase market share</td>
<td>3 years</td>
</tr>
<tr>
<td>Intel</td>
<td>Supply chain</td>
<td>Strong</td>
<td>Mutual accountability</td>
<td>High</td>
<td>Focus is on building long-term relationships</td>
<td>Increase market share</td>
<td>3 years</td>
</tr>
<tr>
<td>Motorola</td>
<td>Supply chain</td>
<td>Strong</td>
<td>Mutual accountability</td>
<td>High</td>
<td>Focus is on building long-term relationships</td>
<td>Increase market share</td>
<td>3 years</td>
</tr>
<tr>
<td>Canon</td>
<td>Supply chain</td>
<td>Strong</td>
<td>Mutual accountability</td>
<td>High</td>
<td>Focus is on building long-term relationships</td>
<td>Increase market share</td>
<td>3 years</td>
</tr>
<tr>
<td>GE</td>
<td>Supply chain</td>
<td>Strong</td>
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</tbody>
</table>