December 2005

Orchestration in ICT-enabled Business Networks: A Case in the Repairs Industry

Xavier Busquets
ESADE Business School

Ellen Christiaanse
ESADE Business School

Juan Rodon
ESADE Business School

18th Bled eConference

eIntegration in Action

Bled, Slovenia, June 6 - 8, 2005

Orchestration in ICT-enabled Business Networks: A Case in the Repairs Industry

Juan Rodon, Xavier Busquets, Ellen Christiaanse

ESADE Business School, Spain
joan.rodon@esade.edu, xavier.busquets@esade.edu, ellen.christiaanse@esade.edu

Abstract

Although business network orchestration has been widely studied in the literature, this paper calls for more research to understand the management and use of the ICT that supports the relationships of business networks. The aim of the paper is to explore existing and new functions attributed to orchestrators in ICT-enabled business networks, as well as examine the effects of orchestrators' actions and decisions on the network of relationships and the performance. We illustrate these functions with a case study in the repairs and emergency services industry. This paper proposes that business network orchestrators must act as integrators in order to leverage the benefits from using ICT to support the business network relationships and processes.

1. Introduction

The increase in inter-organizational collaboration (Dyer et al. 1998) and the subsequent formation of new types of business networks (BNs) characterized by trust, commitment, and high levels of information exchange (Christopher 2000), have turned the effective management of the inter-organizational relationships into a crucial managerial ability (Ritter et al. 2003). Although there is a little doubt about the potential benefits that BNs can accrue from the use of new ICT (Barua et al. 2004; Vervest et al. 2005), there are few research studies that look at managerial practices in the design and operation of business networks enabled by ICT (ICT-enabled BNs).

In this paper we explore the concept of central coordination in ICT-enabled BNs. This form of coordination is performed by firms called orchestrators (Hinterhuber 2002) or brokers (Miles et al. 1986). We argue that the literature on BN orchestration has not paid much attention –with Vervest (2005) and Österle (2001) being exceptions- to the role of ICT in the design and operation of BNs. Therefore, this paper broadens the concept of BN orchestration (Hinterhuber 2002) by also considering the management of the ICT infrastructure that supports the BN as another function of the orchestrator. Thus, the main research question is: which actions and decisions does the network orchestrator make

during the design and operation of ICT-enabled BNs? Moreover, how do these actions impact the BN?

In order to answer these questions, we develop a case study of a European BN whose focal firm is eRepairs (the real name of the company has been withheld), a Spanish company that has operations in three different European countries: Spain, France and the United Kingdom. In order to fulfill the service, eRepairs deals with a set of thousands of trade professionals, small firms that provide the final repair service to individual or business claimants. We explore the actions of eRepairs, the transformations that occur in the network relationships, and the use of ICT.

The paper is organized as follows. First, we conduct a literature review on BN coordination and orchestration, as well as on integration and patterns of ICT use. Then, we introduce the case study. The section that follows analyzes and discusses the findings from the case study. Finally, we present some concluding remarks.

2. Literature Review

In the present research we opt to define a BN as a set of "inter-organizational relationships between the focal actor and interdependent external actors closely linked and working cooperatively together to fill customer orders" (Delporte-Verneiren et al. 2004). This definition recognizes the existence of a central node and the need for coordinating the activities and actors in the BN. Coordination starts with the set up of the BN and has to be continuously taken out throughout the value creation activities in the BN. The effective functioning of a business network depends upon (1) "the effective management and implementation of key business processes, (2) the effective communication and coordination between firms in the network, and (3) the creation of an effective interface between the network and its environment" (Vervest et al. 2005). These three factors are related with the coordination of BNs through processes and structure, both with the support of ICT.

Coordination theory (Malone et al. 1994) defines coordination as the managing of dependencies between activities. The mechanisms for managing these dependencies are information-processing activities, and therefore, good candidates to be supported by ICT. Secondly, the BN as a mechanism for the governance of the social, economic and political life (Thompson et al. 1996) can be coordinated through the structure of a group of organizations. This structure can be viewed as a collection of network nodes and a set of relationships that link them. Firms in the BN need each other in order to achieve their goals, meaning that there exists interdependence between the BN members. Depending on the existing type of interdependence (i.e. pooled, sequential and reciprocal) between BN partners, different coordination mechanisms (i.e. standards, rules, schedules) and types of ICT may be suitable (Kumar et al. 1996).

Another important element that arises from our definition of BN (Delporte-Verneiren et al. 2004) is the existence of a centralized form of coordination. This form of coordination is performed by a BN orchestrator (Hinterhuber 2002). A BN orchestrator is a firm or set of firms in the BN, which coordinates the activities of a wide array of partner companies and relates them effectively (Hinterhuber 2002). It is usually a dominant organization that searches for and selects partners to be pulled in for a particular business opportunity (Chandrashekar et al. 1999; Hoogeweegen et al. 1999; Miles et al. 1986). BN orchestrators will be connected to most of the BN members and thus have high centrality. As a result of this centrality, they will enjoy positive resource asymmetries (Gnyawali et al. 2001). Based on the theory of structural holes (Burt 1992), the orchestrator bridges the structural holes (gaps in information flows) that exist between end customers and partner companies. By filling the existing structural holes orchestrators enhance their control of

the information that flows between BN members, and hence can accrue information benefits (Gnyawali et al. 2001). For instance, the orchestrator may have access to information about the resources and capabilities of BN members, or the demands of end customers (Koppius et al. 2005).

BN orchestrators have been attributed four functions:

1. As *architects*, they define the objectives and designate the partners that will be part of the network (Chandrashekar et al. 1999; Christiaanse et al. 2000; Hinterhuber 2002).
2. As *judges*, they define and defense the expected performance standards for BN members (Hinterhuber 2002).
3. As *developers*, they nurture and develop the physical and intellectual assets of the BN. This includes developing the competencies and capabilities of partner companies (Hinterhuber 2002).
4. As *leaders*, they solicit voluntary participation and reward performance (Chandrashekar et al. 1999; Hinterhuber 2002).

Considering the context of ICT-enabled BNs, a function that specifically concerns the management of the ICT infrastructure that supports the interactions between members is missing. Although this task can be performed by any member in the network or even third-parties (i.e. electronic hubs) this paper considers the case in which the focal firm is the one that performs this function, which we call integrator. The *integrator* function refers to the exploitation of ICT to structure and integrate the BN members, and to the promotion of different patterns of ICT use among members.

First, the structuring task encompasses the definition and sequencing of the activities in the BN (Christiaanse et al. 2000) and the organization of the dependencies between the tasks of network members (Österle et al. 2001). The orchestrator is expected to structure the BN so that information is transferred to the members that need it.

Table 1: Levels of integration in BNs

Level	Goal & Description	Mechanisms
Business	Provide a single face to the end customer, reduce cultural organizational misalignments in the BN, and integrate the different BN members' competences (Hamel et al. 1994).	Reciprocity Trust
Process	Link processes among business partners in order to have a unique network process that enhances automation and non-redundancy of activities (Hammer 2001), and allows real-time coordination and pragmatic integration (the message transmitted is not only understood by the receiver but also triggers some actions) (Österle et al. 2001).	Process standards (i.e. CIDX, RosettaNet)
Data	Have common data definitions that enable BN members to process data in real-time, share and automate information exchanges (Goodhue et al. 1992), as well as syntactic (data have the same representation in terms of order, length, and type) and semantic (data have the same meaning) integration (Österle et al. 2001).	Data standards (i.e. EDIFACT, ANSI)
ICT	Link computer systems of the different BN members in order to provide visibility of information, facilitate accessibility from any point, and have real-time communication (Hasselbring 2000; Markus 2000).	ICT standards (i.e. TCP/IP, Web Services)

Second, the integration of the BN refers to the ICT-enabled operation and interaction of BN members as a unified system. This encompasses four levels of integration: ICT, data, process and business (Table 1). Several mechanisms will enable the achievement of integration at each level (last column in Table 1).

Third, regarding the ICT use we distinguish between two complementary patterns: exploitation and exploration (March 1991; Subramani 2004). Exploitation refers to the automation and implementation the existing practices in order to obtain operational efficiencies and greater control over the process execution over the resources (i.e. process execution, optimal use of facilities). On the other hand, exploration refers to the search for and the discovery of novel and innovative practices (i.e. new processes or products) (March 1991; Subramani 2004). Subramani showed that the use of ICT for exploitation is dominant in enabling the creation and deployment of specialized business processes, whereas the use of ICT for exploratory purposes is dominant in enabling the development and use of specialized domain knowledge (Subramani 2004).

3. Case Description

3.1 Research Methodology

Given the exploratory nature of ICT-enabled orchestration, we employ the case study method (Yin 2003). The reason is that a case study is particularly good for understanding the interactions between technology and organizations (Benbasat et al. 1987) and answering the how and why questions (Yin 2003). The case relies on 10 in-depth interviews (about 1.5 hours each) performed in the period between November 2003 and December 2004 at different members of the business network (focal firm, trade professionals and corporate clients), internal documents from the companies, teaching cases, and press articles. Data collection focused on the events, decisions, changes, and roles in the BN during the period 1999-2004.

3.2 Business Network Background

eRepairs was founded in Spain in the early eighties to provide repair, refurbishment and emergency services to private individuals and small businesses directly by subscription, assuring a 24-hour, 365-days-a-year service. In order to provide the services eRepairs designed a BN (Figure 1). We consider as part of the network those firms that interact with eRepairs. For the object of the paper we focus on the "Repair Management Service" (RMS), where eRepairs, trade professionals, end customers and corporate clients are involved (see Appendix A for a description). The unit of analysis will be the relationship between eRepairs and trade professionals (vertical cooperation along the value chain).

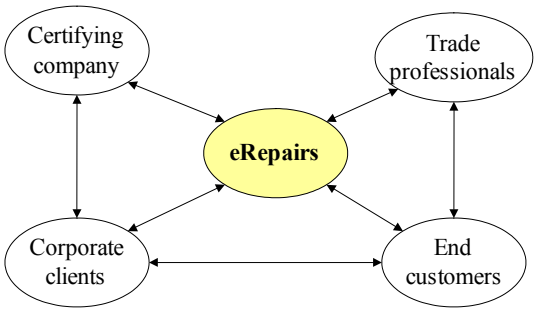

Figure 1: Actors in the Business Network

3.3 The RMS before 2000

RMS was fulfilled through a nationwide network of trade professionals –most of them self-employed– who were coordinated geographically by eRepairs' management in each country. eRepairs conceptualized RMS to the professionals as a door through which they could enter the market where they were not going to be cheated. Trade professionals who obtained the eRepairs franchise were also allowed to work for other customers. The repair service was based on the management of the customer's phone call and the opening of a repair order, which was then assigned to a subcontracted trade professional. From the outset eRepairs centralized the management of phone calls that requested a repair service. In 1995, eRepairs implemented a call centre with about 300 operators who managed the incoming and outgoing calls for thee different countries. When an end customer had a claim he called his insurance company. This call was then transferred to the eRepairs' contact centre –without any additional cost for the end customer- where it was managed. On average, each claim originated between 3 and 4 phone calls (incoming and outgoing). In 1995 eRepairs received 10,000 incoming calls and made 2,000 outgoing calls a day. eRepairs' computers balanced out the number of calls taken by each operator, and measured the average time customers had to wait before their call was answered, in addition the time between the receipt of the call and the arrival of the professional at the customer's home. They also used digital processing technology (i.e. scanners, bar codes, CD-ROMs, etc) to minimize the use of paper.

3.4 The Redesign of the Business Network

In the late nineties, the continuous growth of the number of customers and the lack of automation of the process, made the repair process slower and more complex. The cost of coordinating the network of trade professionals and of assuring the quality of the service dramatically increased. In 2000:

- The number of trade professionals had increased to almost 11,000.
- The number of daily phone calls had gone up to 17,000.
- The number of claims had also increased sharply, nearly 0.8 million a year.
- The average number of calls for a claim had gone up to 5.5.

The data above shows scalability problems. The coordination of trade professionals demanded more eRepairs workers (there were more than 400 eRepairs employees

managing repair claims). The amount of paperwork related to the management of end month's repair orders (i.e. invoices) had increased. The main communication channels between end customers, eRepairs and trade professionals were telephone and fax. Another big problem arose from the management of the customer complaints due to quality problems with the repair. When there was a complaint, an eRepairs employee visited the claimant's home to verify the quality of the work carried out by the trade professional. If there was a basis for the complaint, eRepairs assigned another trade professional to sort out the problem. In such cases, eRepairs was responsible for all the expenses. According to eRepairs' chairman:

> *"The main problems of the management model existing in 2000 were the quality assurance of the service and the control of the high costs arising from the complexity of the repair assignment management. It was moreover very difficult to foresee operating costs due to the type of relations that we maintained with the network of professionals".*

Then, the management of eRepairs foreseeing the risk of collapse –due to the high costs derived from the operation of RMS, and the type of relationship with trade professionals- decided to lead a project of BN redesign based on the Internet. eRepairs' CIO argues that:

> *"The objectives sought were to assure the control and the continuity of the process, to ensure its scalability and to provide it with tools for the management of peaks of demand and exceptions during the process. We therefore decided to take advantage of the opportunity to use the Internet as a communication channel and as an element of integration with our network of clients and professionals…What defined our project was placing the process on the Internet."*

First, eRepairs designed a seamless, unique ICT-enabled process consisting of four steps (Appendix B). According to eRepairs' CIO:

> *"Our model is that of making the whole process transparent. The integration of processes on the Internet has allowed us to define a 'virtual machine of finite states' with very precise expiry dates between states. The application has about 100 controlled steps linked to our clients and trade professional applications. When an exception occurs, we must offer all the information available to the person directly responsible for its management to make the decision-making more effective."*

eRepairs' contact centre manager added:

> *"The professionals have an agreed contact time and, if it is not respected, the system sets off an alarm with the back-office agent responsible for monitoring the claim. The trade professional is then contacted for information on why an appointment has not been made with the end customer and to follow the process until the closure of the repair is ensured."*

Second, eRepairs redefined the relationship with the trade professionals. eRepairs asked them for exclusivity, and in contrast assured them higher volumes of work based on standard price tables. From an initial situation were trade professionals were freelance, they became managers of small businesses with a franchise agreement with eRepairs. This has led to a progressive reduction in the number of trade professionals in the BN (from a peak of 11,000 in 2000 to 5,750 in 2004). eRepairs negotiated and promoted discount prices for the trade professionals in order to equip all of them with a computer, Internet access, and a mobile phone. The Internet adoption by trade professionals grew

from 10% in 2000 to 95% in 2004. Moreover, eRepairs started acting as an application service provider for those trade professionals who were interested, providing them with tools to manage accounting and tax applications. Two trade professionals, who merged after 2000, recalled the following:

> *"Initially I did jobs for eRepairs and others that I found by myself. eRepairs required me to have computer applications and comply with very strict quality standards. At first [my partner] and myself worked separately, but eRepairs advised us on forming a business that could fulfill the requirements that they set. To aid us in accessing to the technology, in 2000 eRepairs gave us a special offer for personal computers and Internet access. Now we are used to working with this technology: our computer raises an alarm when the repair has to be carried out in less than three hours."*

For those trade professionals who already had a system in place eRepairs developed web services in order to facilitate the systems interconnectivity. On the other hand, eRepairs started doing auto-invoicing (electronically invoices on behalf of the trade professionals) twice a month (whereas previously trade professionals invoiced once a month). This allowed trade professionals to reduce most of the paperwork, which in the past had represented around 50% of their working time.

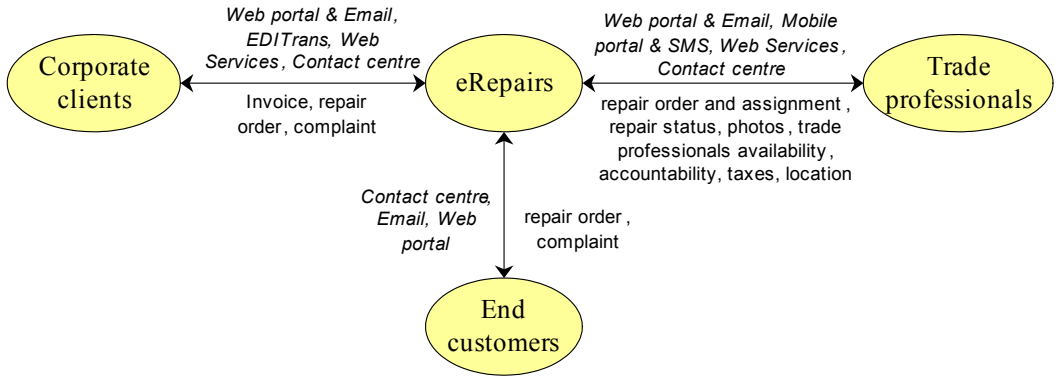

Figure 2: ICT and information exchanges after year 2000

4. Case Analysis

This case presents an example of the development of a BN, which results from an engineering activity performed by a triggering entity (eRepairs). eRepairs is the focal firm and coordinates the value creation activities. The scope of the BN is to provide repair services to end customers by combining the services of the trade professionals. Although eRepairs may choose a different set of trade professionals for each business opportunity (a repair claim), the choice of partners in the BN is stable. However, until 2000, trade professionals could accept or refuse to do any repair. eRepairs depended on the trade professionals but trade professionals did not exclusively depend on eRepairs (asymmetrical interdependence). So, trade professionals behaved opportunistically when they could decide whether or not to join the network depending on how attractive the business opportunity was. In the late nineties, after more than a decade of continuous growth, scale problems arose and eRepairs used ICT to re-engineer the processes and relationships in the BN. The reasons for change were: an increase in the demand for

quality of service and the lack of control eRepairs had over the process, the need to reach economies of scale that enabled an easy replication of the model for growing in new markets, and the non-scalability of the former ICT infrastructure. Next we present the actions performed by eRepairs as an orchestrator.

4.1 Architect, Judge and Leader

eRepairs defined the profile for the trade professionals in the BN, the objectives (i.e. in terms of performance, its measurement and its compensation), and the rules (i.e. exclusivity) that trade professionals should satisfy. At the same time eRepairs established a service level agreement with both end customers and corporate clients, and contracted a certifying company to audit the quality of the service (figure 1).

Before 2000, trade professionals were the ones who decided when to work with eRepairs. They were free to accept or refuse a business opportunity coming from eRepairs. eRepairs asked them to do a repair, but trade professionals were the ones who decided. After 2000, the situation changed completely. eRepairs offered them the possibility to join the BN and be franchised. Trade professionals were free to accept, but if they did then they had to follow the rules established in the BN by eRepairs.

4.2 Developer

Trade professionals had historically been freelance. In the new situation they had to grow in size, which meant that they had to face new management challenges. eRepairs then provided them with support in the daily management of their administrative operations, equipped them with the necessary ICT resources (in order to foster ICT adoption among trade professionals, eRepairs promoted Internet access, mobile systems and PCs). The franchised trade professionals gained a powerful marketing tool over non-franchised competitors. They also benefited from faster receivables turn made possible by the auto-invoicing functionality. This allowed trade professionals to concentrate on their core competences (repairing).

4.3 The Integrator Function

eRepairs has increased its integration with trade professionals by: 1) redesigning the business process for RMS, 2) developing a unique process for the whole BN which enhanced the automation and non-redundancy of activities in the process, and 3) giving continuity to the process with ICT. The new computer system embeds the coordination of the repair process, thus allowing eRepairs to coordinate and control the flows of information, services, physical products (i.e. spare parts) and revenue through the BN. ICT are used not only for automation but also for control. An example of this can be seen in the generation of exceptions when trade professionals do not attend to the claim within the agreed time. However, trade professionals do not mind being subjected to greater control because this also favors them, in the sense that they could be more productive (focus on their repair job). In addition, the ICT are used to audit the quality of service and measure the performance indicators.

eRepairs has centralized the management of the process and the information, and gives the information to the person who needs it in order to make a decision (i.e. trade professionals have more information in place). Likewise, eRepairs has more visibility over the relationships with trade professionals: knows their capacity, their availability, the status of a repair, their revenues, etc. Coordination is facilitated because eRepairs and

trade professionals are integrated. Next table illustrates examples of the four levels of BN integration.

Table 2: Levels of integration in the case

Level	Case study illustration
Business	eRepairs' CEO observes: "trade professionals are the image of eRepairs for end customers". eRepairs provides them with material and training. On the other hand, trade professionals feel they are part of eRepairs. Both are committed to the relationships.
Process	eRepairs jointly developed with corporate clients a seamless unique process to fulfill RMS.
Data	eRepairs has visibility over trade professionals' data (i.e. capacity, revenues) and the process. Trade professionals have real-time information about the repair. Corporate clients also have information about their customers' repair status.
ICT	Before 2000 phone and fax were the main communication channels. After 2000, the BN actors not only started using multiple channels, but eRepairs also integrated them (Appendix B). Trade professionals who already had computer systems in place are integrated with eRepairs systems through web services technology. Information about the process can be accessed at any point and anytime from a PC, mobile phone or landline.

Another consequence of the use of ICT is the depersonalization of the communication process. There is more real-time information available and more intense communication between members (especially vertical communication between eRepairs and trade professionals) but less human intervention in the repair process (i.e. automated assignment of a repair, auto-invoicing).

On the other hand, we observe the two patterns (exploitation and exploration) of ICT use (Table 3). Exploitative uses of ICT deal with structured information and routinely tasks, whereas explorative uses deal with new product development (i.e. virtual, remote surveyor's inspection), process development (i.e. better task planning) and customer development (i.e. from new customer acquisition to changed interaction patterns) tasks.

Table 3: Patterns of ICT use in the case

ICT use for exploitation	ICT use for exploration
o Automatic location and assignment of claims to trade professionals o Electronic reception of claims from end customers o Auto-invoicing o Automatic generation and control of exceptions o Multi-channel integration (email, phone, website, etc)	o The analysis of end customer data claims enables eRepairs to estimate demand for trade professionals o eRepairs provides corporate clients with information about end customers (number of claims, their status, average costs, causes of repudiation by geographic areas, etc), as well as, the information about other corporate clients' customers that work with eRepairs o The trade professional takes and sends eRepairs a photo of the damage, which enables virtual, remote surveyor's inspection.

5. Discussion

BN members (eRepairs and trade professionals) have invested time, human and financial resources in the relationship. The processes and skills required to fulfill the service are specific to the relationship. As a result, members' level of lock-in to the BN has increased. On the other hand, the threat of opportunistic behavior by the trade professionals has been reduced, and the degree of interdependence between members has shifted in favor of eRepairs (i.e. although eRepairs still depends on the trade professionals' availability and work, trade professionals now completely depend on eRepairs in terms of sales). The redesign of the process and the use of ICT altered the network of dependencies among eRepairs and trade professionals. This relationship has become tighter and less uncertain. eRepairs guarantees trade professionals a minimum volume of operations, provides them with financial, expertise and technical aid; on the other hand, trade professionals guarantee a minimum capacity and quality of service (in terms of response time, exclusivity, etc).

In this case we observe that after the BN redesign project there has been an increase in the operational efficiency (i.e. reduction in processing errors and in the average number of telephone calls for a repair, increase in the number of claims attended) and effectiveness (i.e. providing more value to corporate clients and end customers, better planning of repair activity) of the BN. This illustrates three things. First, the degree to which information is accessible to the whole network of partners determines the efficiency and effectiveness of BNs (Österle et al. 2001). Second, the level of integration of the BN members may enable or constrain access to the information, and thus impact the performance (efficiency and effectiveness). Third, given a certain level of integration the use of ICT for exploitation leads to greater operational efficiency (i.e. reduction in time and cost dimensions of RMS), while the use of ICT for explorative purposes leads to greater effectiveness.

Finally, this case confirms that the performance of BNs is a multilevel and multifaceted concept. First, it can be manifested at the organizational, dyad or network level (Straub et al. 2004). Second, it may capture the effectiveness from a customer perspective, the operational efficiency of the network processes or the ability of the BN to respond to changing environment (Beamon 1999; Straub et al. 2004). Finally, the ICT can be viewed as producing direct, first-order effects, which in turn generate indirect, second-order effects (Mukopadhyay et al. 2002). For instance, eRepairs and corporate clients jointly design the underlying process of RMS. Besides increasing the operational efficiency and the effectiveness, this has also created new barriers for both to exit the relationship (Porter 2001).

6. Conclusions

In this paper we have explored the role of orchestrators in the design and operation of an ICT-enabled BN and the transformations that occur in the BN. Although previous studies (Hinterhuber 2002) have already looked at BN orchestration, few have examined the use and management of the ICT to support the relationships in the BN (Österle et al. 2001; Vervest et al. 2005). This research confirms the four orchestrators' functions (architect, judge, developer and leader) already discussed in the literature (Hinterhuber 2002), and adds a new one, the *integrator*, which deals with the exploitation of ICT to structure and integrate the BN, as well as the promotion of different patterns of ICT use among members.

This paper provides an example of change in the interdependence between BN partners through the use of ICT. In addition, this research also gives insights about the impact of

ICT-enabled integration on the existing inter-firm relationships; on the communication, coordination and control processes; and on the efficiency and effectiveness of the BN. We believe future research should explore the *integrator* function performed by orchestrators in other settings. Although there has been recent attempts to measure the business value of IT-enabled BN (Barua et al. 2004; Straub et al. 2004) we think further research should explore in-depth the relationship between the degree of BN integration, as well as the ICT use in BNs, and the performance outcomes.

References

Barua, A., Konana, P., Whinston, A.B., and Yin, F., (2004): An empirical investigation of net-enabled business value, MISQ Quarterly, Vol. 28, No. 4, pp. 585-620.

Beamon, B.M., (1999): Measuring Supply Chain Performance, International Journal of Operations & Production Management, Vol. 19, No. 3, pp. 275-292.

Benbasat, I., Goldstein, D.K., and Mead, M., (1987): The Case Research Strategy in Studies of Information-Systems, MISQ Quarterly, Vol. 11, No. 3, pp. 369-386.

Burt, R.S., (1992): "Structural Holes," Harvard University Press, Cambridge.

Chandrashekar, A., and Schary, P.B., (1999): Toward the virtual supply chain: The convergence of IT and organization, International Journal of Logistics Management, Vol. 10, No. 2, pp. 27-39.

Christiaanse, E., and Kumar, K., (2000): ICT-enabled coordination of dynamic supply webs, International Journal of Physical Distribution & Logistics Management, Vol. 30, No. 3, pp. 268-285.

Christopher, M., (2000): The Agile Supply Chain: Competing in Volatile Markets, Industrial Marketing Management, Vol. 29, No. 1, pp. 37-44.

Delporte-Verneiren, D.J.E., Vervest, P.H.M., and van Heck, E., (2004): In Search of Margin for Business Networks: The European Patent Office, European Management Journal, Vol. 22, No. 2, pp. 167-182.

Dyer, J.H., and Singh, H., (1998): The relational view : cooperative strategy and sources of interorganizational competitive advantage, Academy of Management Review, Vol. 23, No. 4, pp. 660-679.

Gnyawali, D.R., and Madhavan, R., (2001): Cooperative networks and competitive dynamics : a structural embeddeness perspective, Academy of Management Review, Vol. 26, No. 3, pp. 431-445.

Goodhue, D.L., Wybo, M.D., and Kirsch, L.J., (1992): The Impact of Data Integration on the Costs and Benefits of Information Systems, MIS Quarterly, Vol. 16, No. 3, pp. 293-311.

Hamel, G., and Prahalad, C.K., (1994): "Competing for the Future: Breakthrough Strategies for Seizing Control of your Industry and Creating the Markets of Tomorrow," Harvard Business School Press, Boston, MA.

Hammer, M., (2001): The Supperefficient Company, Harvard Business Review, Vol. 79, No. 8, pp. 82-91.

Hasselbring, W., (2000): Information System Integration, Communications of the ACM, Vol. 43, No. 6, pp. 33-38.

Hinterhuber, A., (2002): Value Chain Orchestration in Action and the Case of the Global Agrochemical Industry, Long Range Planning, Vol. 35, No. 6, pp. 615-635.

Hoogeweegen, M., Teunissen, W.J.M., Vervest, P.H.M., and Wagenaar, R.W., (1999): Modular Network Design : Using Information and Communication Technology to Allocate Production Tasks in a Virtual Organization, Decision Sciences, Vol. 30, No. 4, pp. 1073-1103.

Koppius, O., and van Heck, E., (2005): Supply and Demand Driven Coordination in Smart Business Networks, in "Smart Business Networks", Springer, Berlin Heidelberg.

Kumar, K., and van Dissel, H.G., (1996): Sustainable collaboration : Managing conflict and cooperation in interorganizational systems, MIS Quarterly, Vol. 20, No. 3, pp. 279-300.

Malone, T., and Crowston, K., (1994): The interdisciplinary study of coordination, ACM Computing Surveys, Vol. 26, No. 1, pp. 87-119.

March, J.G., (1991): Exploration and Exploitation in Organizational Learning, Organization Science, Vol. 2, No. 1, pp. 71-87.

Markus, M.L., (2000): A Paradigm Shift in E-Business - Systems Integration, Communications of the AIS, Vol. 4, No. pp. 45.

Miles, R.E., and Snow, C.C., (1986): Organizations: New Concepts for New Forms, California Management Review, Vol. 28, No. 3, pp. 62-73.

Mukopadhyay, T., and Kekre, S., (2002): Strategic and Operational Benefits of Electronic Integration in B2B Procurement Processes, Management Science, Vol. 48, No. 10, pp. 1301-1313.

Österle, H., Fleisch, E., and Alt, R., (2001): "Business Networking - Shaping Collaboration Between Enterprises," Springer, Berlin, Heidelberg, New York.

Porter, M.E., (2001): Strategy and the Internet, Harvard Business Review, Vol. 79, No. 2, pp. 63-78.

Ritter, T., and Gemünden, H.G., (2003): Network competence: Its impact on innovation success and its antecedents, Journal of Business Research, Vol. 56, No. 9, pp. 745-755.

Straub, D., Rai, A., and Klein, R., (2004): Measuring Firm Performance at the Network Level: A Nomology of the Business Impact of Digital Supply Networks, Journal of Management Information Systems, Vol. 21, No. 1, pp. 84-114.

Subramani, M., (2004): How do suppliers benefit from information technology use in supply chain relationships?, MIS Quarterly, Vol. 28, No. 1, pp. 45-73.

Thompson, G.J., Rances, R., Levacic, J., and Mitchel, J.C., (1996): "Markets, heirarchies and networks : the coordination of social life," Sage, London.

Vervest, P.H.M., van Heck, E., Preiss, K., and Pau, L., (2005): "Smart Business Networks," Springer, Berlin, Heidelberg.

Yin, R.K., (2003): "Case Study Research: Design and Methods," Sage, Thousand Oaks, CA.

Appendix A: Description of the BN actors

BN actor	Description
eRepairs	Focal firm in the network that coordinates the RMS (receives the phone call, assigns a trade professional, monitors the process, closes the service and makes the invoice).
Corporate Clients	Banks, Insurance companies or retail chains that outsource the repair management service they offer to their customers to eRepairs.
Trade professionals	They are the one who provide the final repair service to the claimants. Until year 2000 they were usually self-employed, who worked for eRepairs but also for other local customers.
End customers	Individuals or companies that subscribe an insurance policy with: (1) eRepairs, (2) another insurance company, bank, retail chain, etc, or (3) non-subscribers who call eRepairs for a specific repair service and pay for it.
Certifying company	Firm who is in charge of auditing the quality of service that eRepairs and the network of trade professionals provide to Corporate Clients and Ends Customers.

Appendix B: Process steps of Repair Management Service after 2000

	Opening	Assignment	Exception control	Closing & invoicing
Description	Receipt of the repair claim	The assignment of the repair order to a trade professional is carried out automatically using a software application. Trade professionals can receive a message on their mobile or an email (push), or they can go to the website and look for a new repair (pull)	Trade professionals have an agreed time to attend the request. When they reach the claimant's home, they report back to the eRepairs System through an SMS or the Mobile Portal. If the eRepairs System does not receive this confirmation an exception is generated, and an eRepairs agent manages and monitors the claim until it is fulfilled. Trade professionals can also take a picture (with the mobile phone) of the claim and send it to the eRepairs System for future surveyor's claim.	On ending the repair, the trade professional reports the completion of the service and his new availability. He also informs the system about the costs incurred in the repair service (using a pre-established price table). Later, eRepairs automatically generates electronic invoicing to the Insurers or the end customer, depending on the claimant's insurance policy.
Actors involved	Claimant (end customer), eRepairs contact centre agent	eRepairs System (software application), and trade professional.	Trade professional, eRepairs System (software application), eRepairs contact centre agent (when there is an exception)	Trade professional, eRepairs System, Insurer
ICT before 2000	Phone	Phone (push)	Phone	None (invoices were paper-based and manually checked at eRepairs)
ICT after 2000	Phone, e-mail, fax Integration of channels	Web portal, e-mail, SMS, Mobile portal Push and pull	SMS, Mobile portal, phone. Control of exceptions	Mobile portal, e-mail, SMS, Web portal, EDITrans. No paper processing and electronic invoicing