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Focus of Information Systems in Collaborative Supply Chain Relationships

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Abstract
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Keywords: Case study, Information systems, Inter-organizational Information Systems, Supply Chain Collaboration, Supply Chain Management

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ABSTRACT

This paper investigates how companies develop and use information systems to support collaboration with their supply chain partners. For this purpose the case study approach is adopted and used to analyze empirical data collected from eight collaborative buyer-supplier relationships. As a result of the study three profiles – internal foci, external foci, and supply chain foci – were identified from the data to represent the manner in which the companies develop and use information systems to support collaboration with their supply chain partners. The findings further emphasize that companies should consider whether the focus of their information systems development and use addresses the present as well as the future needs for supporting collaboration with their supply chain partners.

Keywords: Case study, Information systems, Inter-organizational information systems, Supply chain collaboration, Supply chain management

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1. Introduction

Information systems are becoming evermore prevalent for the facilitation of collaboration between the members of supply chains and are increasingly considered as a prerequisite for the efficient management of supply chains (e.g. Bagchi and Skjoett-Larsen, 2003; Bowersox and Daugherty, 1995; Gunasekaran and Ngai, 2004). Particularly the importance of inter-organizational information systems (IOS) has been emphasized and the benefits identified to accrue from their adoption to support information exchange between supply chain partners have been widely acclaimed (Barrett and Konsynski, 1982; Kekre and Mukhopadhyay, 1992; Kulp *et al.*, 2004; Lee *et al.*, 1999; Straub and Watson, 2001). At the same time, the importance of companies' internal information systems as an infrastructure upon which the IOS are implemented has been acknowledged and they have been considered to act as a prerequisite for the effective electronic integration between supply chain members (Banker *et al.*, 2006; Burca *et al.*, 2005; Davenport and Brooks, 2004; Hart and Estrin, 1991; Koh *et al.*, 2006). Consequently, both the IOS implemented between companies as well as their internal information systems should be examined when investigating the use of information systems for supporting collaboration between the members of a supply chain. This way a richer understanding can be acquired of how the information systems support the collaboration and the possible restrictions posed by the internal information systems for the adoption of IOS between the supply chains members can be better understood.

What should also be acknowledged when studying information systems in the supply chain context is that companies have different types of supply chain relationships. For example, for the procurement of different types of products and services – varying e.g. according to their value, demand characteristics, and scarcity and flexibility of their supply – different types of supply chain relationships have been considered appropriate (e.g. Fisher, 1997; Kraljic, 1983). Now the development and use of information systems for supporting the different types of supply chain relationships can be expected to differ. For instance the development and use of information systems to support electronic market type of procurement has been considered appropriate strategy for the purchasing of standardized products with abundant supply (e.g. Malone *et al.*, 1987; 1989). Meanwhile, in the case of complex products and services with

scarce and inflexible supply more collaborative supply chain relationships have been considered appropriate. Here information systems are developed and used to support deeper collaboration between the members of a supply chain and with the establishment of trust the supply chain partners can be persuaded to exchange in addition to transactional data also proprietary information with each other via IOS (Hart and Saunders, 1997; 1998).

The study at hand investigates how companies develop and use information systems to support collaborative supply chain relationships. Both the companies' internal information systems as well as the IOS that they have implemented between them to facilitate information exchange are examined. The objective of the study is to: *seek profiles to represent the manner in which companies develop and use of information systems to support collaboration with their supply chain partners.* For this purpose, the case study approach is adopted and used to analyze empirical data collected on the development and use of information systems in eight collaborative buyer-supplier relationships. Next the methodology of the study is presented. This is followed by the results of the case studies. Conclusions part then summarizes the main findings of the study.

2. Methodology

This section presents the research design, characteristics of the research sample, as well as the collection and analysis of data used in the study.

Research design

The case study approach was chosen as the research method for the study as it is considered appropriate for intensively studying the nature and context of the phenomenon of interest (Benbasat *et al.*, 1987; Yin, 1990). It has also been considered a suitable research strategy for the study of information systems (Dube and Pare, 2003; Lee, 1989). Hence, as the study at hand investigates the development and use of information systems for supporting collaboration between supply chain partners, a phenomenon deeply embedded in its context, the selection of the case study approach can be considered suitable for its purposes. Further, the multiple case study design was chosen to allow for cross-case analysis and better generalizability of the findings (Eisenhardt, 1989).

The selection of the research sample was based on the approach of purposive sampling (Lincoln and Guba, 1985) and was conducted in two steps. First, four companies were selected based on access and the criteria that different types of companies should be included in the sample. Second, with the help of these four companies eight of their buyer-supplier relationships were selected for the in-depth studies based on the criteria that significant collaboration should take place in the relationships between the companies and their supply chain partners.

The buyer-supplier relationships selected for the study include a variety of companies differing from each other in their size as well as the type of products and services that they produce. This can be considered to contribute to meeting the objective of the study, which is to seek profiles for how companies develop and use information systems in collaborative supply chain relationships, as the inclusion of different types of collaborative supply chain relationships and companies in the research sample can be considered to improve the generalizability of the findings.

Characteristics of the research sample

Figure 1 presents the characteristics of the companies engaged in the eight buyer-supplier relationships examined in this study. In the figure and hereinafter the four companies that we collaborated with are identified with capital letters (A, B, C and D) while their supply chain partners are identified with a normal letter and a number (a1, a2, a3, b1, b2, c1, d1 and d2). Of the 12 companies engaged in the examined buyer-supplier relationships, companies a2 and a3 are foreign companies while the rest (A, a1, B, b1, b2, C, c1, D, d1, and d2) are either Finnish companies or business units of multinational companies located in Finland. For the companies group level data for revenue and number of employees is exhibited in the figure instead of business unit level data. The reason for this is that the group level data can be considered to better correspond with the information system and other resources available for the business units examined.

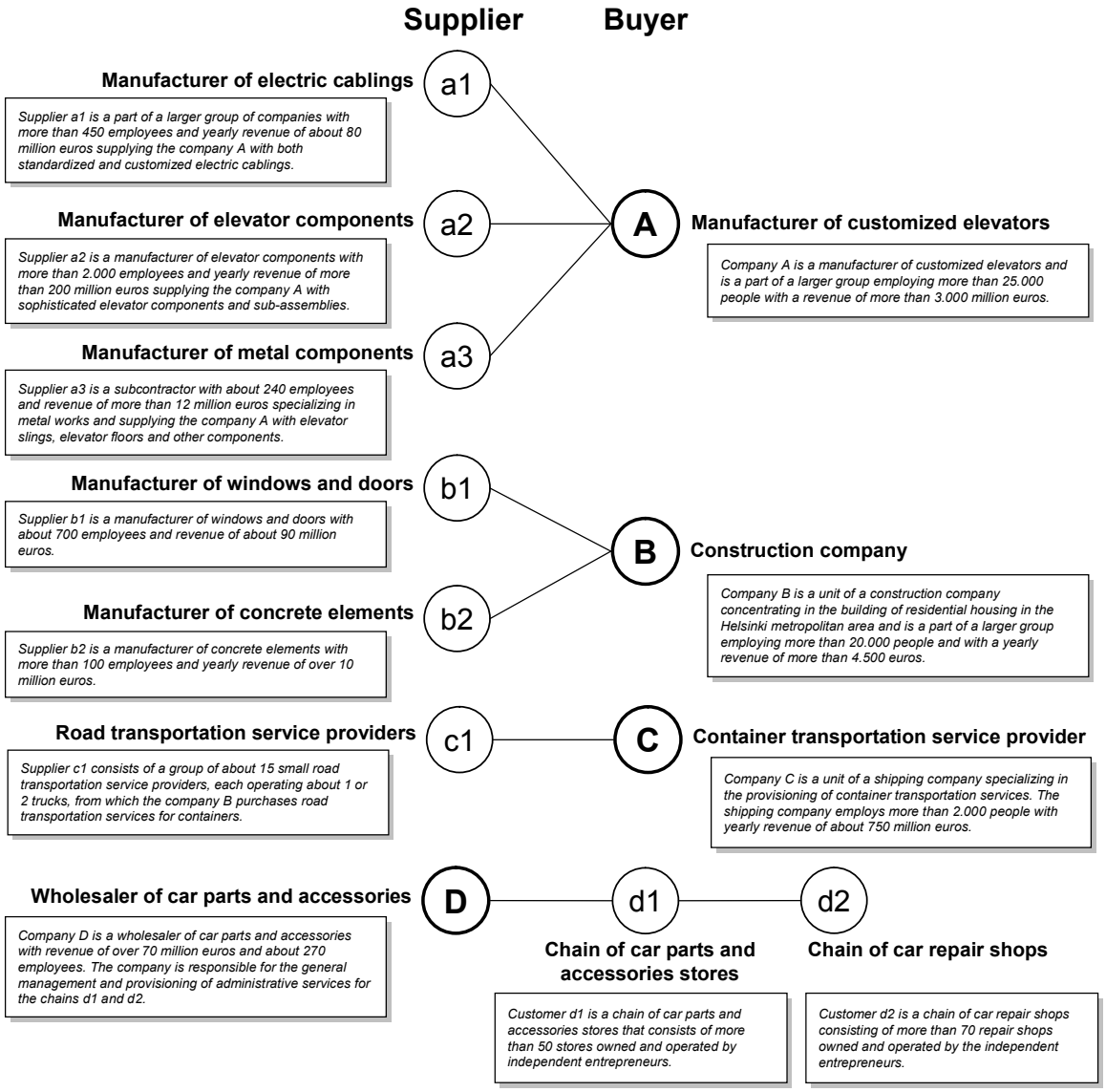


Figure 1: Characteristics of the research sample

Data collection and analysis

Data collection took place during the year 2005. Interviews were used as the main data collection method. The interview questions were designed to address both the information systems as well as the other aspects of the buyer-supplier relationships relevant for understanding the development and use of information systems to support collaboration in the examined buyer-supplier relationships. The questions used as the basis of the interviews were customized for each interview in order to better capture the context of the individual buyer-supplier relationships. A total of 13 interviews were conducted in which 22 different persons were interviewed. In each interview two interviewers and from one to four interviewees were present. The interviews lasted in average two hours and were semi-structured in their nature. All interviews were

recorded to avoid the pitfall of memory lapses and to allow for thorough analysis. The interviews were transcribed based on the recordings and the transcriptions were sent to the companies to be checked for possible errors. All in all, the interviews accumulated over 200 pages of transcriptions providing a rich set of data to be used as the basis of the case study analysis.

The data acquired through the interviews was further supplemented by additional information received from the companies such as process charts and documentation. Moreover, when needs for additional information rose good access was available to the companies and the company representatives could be re-contacted to acquire the required information.

In order to increase the validity of the research both investigator and source triangulation were used (Lincoln and Guba, 1985). Multiple researchers participated in the interviews and checked the transcriptions written (investigator triangulation). Further, multiple respondents were typically present in the interviews and when possible representatives of all the parties engaged in the buyer-supplier collaboration were interviewed (source triangulation).

The data analysis was conducted in two successive phases. First, within-case analyses were conducted and each of the eight buyer-supplier relationships was analyzed separately. The objective of the within-case analyses was to understand how information systems are developed and used by the companies engaged in the examined buyer-supplier relationships to support collaboration with their supply chain partner. Second, cross-case analysis was conducted across the individual cases. The objective of the cross-case analysis was to identify commonalities as well as differences between the companies in the manner in which they developed and used information systems to support collaboration with their supply chain partners.

3. Findings

The findings of the within-case analyses on each individual buyer-supplier relationship are first described. Thereafter the results of the cross-case analysis across the individual relationships are presented.

Company A and its three suppliers

The market for customized elevators in which the company A operates can be characterized as volatile with significant demand fluctuations over time. In addition, the

time within which the company promises the delivery of the elevators to its final customers is very challenging especially when considering the customized nature of the company's products. This represents a challenge for the elevator supply chain especially due to the customized nature of the products. What is more, the material requirements set for the elevators that are installed in special environments, such as hospitals, ships and skyscrapers, differ due to various legislative requirements in different countries. As a result the variety in the materials and components used is huge. All these challenges – fluctuating demand, short delivery times, and huge variety in materials and components – the company hands down to its suppliers.

The company A has implemented a modern ERP system package that offers an integrated information systems infrastructure across the whole company. The ERP system is used to a great extent to facilitate the internal processes of the company A in addition to which it provides good capabilities for supporting the exchange of information with the company's supply chain partners. Further, the company employs the services of a Value Added Network (VAN) service provider, which acts between the company and its partners in all system-to-system type of electronic communication. The use of the VAN service provider enables the company's partners to transmit data electronically to the company structured according to any standard and vice versa as the VAN service provider alters the data to the different formats preferred by the different parties. The company also uses an Engineering Data Management System (EDMS) that it uses with all the three suppliers examined in this study. The EDMS enables the suppliers to access via a web-browser interface the database containing the blueprints and component lists for each product and component to be manufactured for the company A. All in all, the company A can be considered to have developed its information systems to a great extent to support its internal processes as well as the facilitation of information exchange with its partners. The focus of the information systems development has, however, remained mainly within the company's boundaries although the needs for supporting collaboration with the company's supply chain partners have been well taken into account.

Of the three supplier relationships investigated, the supplier a1 is a manufacturer of electric cablings supplying the company A with both standardized and customized electric cablings. The challenges in this supply chain relationship are related particularly to the manufacturing of the customized cablings and the large variety of materials needed for them. The supplier a1 runs a custom-built but rather modern information

system that has been developed by its mother company. The information system provides good support for the internal processes of the company as well as good capabilities for inter-organizational information exchange. The extent of IOS utilization between the companies can be considered to be high as all information that can be exchanged by electronic means between companies is transmitted this way. However, manual work is still required at the suppliers end particularly with the processing of orders comprising of customized cablings. The reason for this is that these cablings have to be created manually as new products to the supplier's information systems before they can be released to the manufacturing.

In this buyer-supplier relationship the information systems at both ends of the buyer-supplier relationship provide good support for the information exchange between the companies, although the customized nature of the products procured sets restrictions for the greater use of information systems to facilitate the transaction processing between the companies. Further, while the information systems of supplier a1 provide good interfaces to enable the electronic exchange of data the focus of information systems development has still largely remained within the company's boundaries.

Supplier a2 is a part of a group that controls a significant portion of the global elevator component market. Its products include sophisticated elevator components and complete sub-assemblies. Currently the most important challenges in the relationship are linked to the amount of manual work related to ordering and specification of the component and sub-assembly features. The reason for the situation is largely that the supplier a2 was, at the time of the study, in the middle of an ERP system implementation. Because of this they had been reluctant to develop the capabilities of their old information systems even though there had been few delays with the starting of the ERP implementation process. The supplier had also been reluctant to develop the use of IOS between the companies before the completion of the ERP implementation as a result of which only extranet type of systems were used at the moment. However, the representatives of the supplier a2 considered that the amount of manual work related to the use of the extranet systems was unnecessarily high and found it necessary to develop system-to-system type of IOS to facilitate more automated information exchange between the companies.

This case underlines the long time span of information systems development and the significance of the investments in time, money, and effort related to their implementation. The unwillingness of the supplier a2 to invest in the development of

IOS before completing the ERP implementation project emphasizes that there rarely is a match in the information systems development cycles of companies engaged in supply chain relationships. Companies are typically reluctant to make short-term investments into information system solutions particularly if they involve process changes. As a result the development of information systems to support collaboration in the supply chain context can be considered to take place on a longer timeframe than the development of companies' internal information systems.

As for the supplier a3, the company A has outsourced about one half of the elevators' metal components to this supplier including the less difficult components. The other half including the more difficult components is produced at the company's own production line. The components outsourced to the supplier a3 can be considered to be rather standardized. More specifically, the materials used in the components do not vary that much even though the measures of the components manufactured differ. There are not major challenges related to this relationships and the supplier a3 is regarded to be among the best suppliers of the company A.

The supplier a3 runs a number of individual information system applications to support its operations. The systems address clearly more the needs of the company's internal processes than provide support for the management of the customer relationships. Also the interfaces to external systems can be considered to be poor and much of the information exchange between the companies is carried out manually. The EDMS system is widely used between the companies in addition to which some data is exchanged via a system-to-system connection between the companies but manual work is still needed at the supplier end to its processing.

In this case the supplier's modest information systems restrict the greater electronic integration between the companies and the more efficient processing of the transaction data. The case provides a good example of how information systems at both ends of the buyer-supplier relationship need to be in good shape to enable efficient electronic networking and as in this case the smaller companies with limited resources to allocate to information systems development often times lack in information system capabilities.

To summarize, the relationship between the company A and the supplier a1 emphasized that the type of products procured in a buyer-supplier relationship can set restrictions particularly for employing information systems to facilitate transaction processing between supply chain partners. Meanwhile, the relationship with the supplier a2 brought fourth especially the long term nature of information systems investments

and how this impacts the information systems development and use in the supply chain context. In supply chains and networks a number of companies are engaged with each other and the development and adoption of information systems seldom takes place at the same time among the members emphasizing the long time frame on which the information systems development takes place in multi-company environments.

Finally, the relationship between company A and supplier a3 draws attention to the limitations that particularly the smaller companies may have in their information systems capabilities. This relationship illustrated how the limited resources of smaller companies may hinder the development and use of information systems to support collaboration between members of supply chains.

Company B and its two suppliers

Company B operates in the construction industry to which is characteristic long projects with huge number of interdependent tasks and last minute schedule changes. Further, in Finland the cold winter causes a strong yearly cycle in the construction industry resulting in significant seasonal fluctuation in the demand for construction materials. The company runs a large number of individual information systems applications developed and adopted to support different tasks and functions within the company. The capabilities for the implementation of IOS then are rather poor and consequently the company does not have in use any IOS with the suppliers examined in this study. The company's information system applications are integrated with each other but the support provided to the management of supplier relationships can be considered to be limited due the inconsistent use of the information systems resulting in old and incorrect data to be present in the systems. Because of this the information can not effectively be used as a basis of the supplier relationship management and for example the company has had at times trouble providing its suppliers with up-to-date information on the constantly changing construction schedules. It should be noted, however, that the construction industry can be characterized as a rather conservative exploiter of information systems and that the company B is among the more innovative users of information technologies within its industry. The information systems development and use can be seen to have an internal focus and to be oriented clearly more towards supporting the company's internal processes than the collaboration taking place with the company's supply chain partners.

The supplier b1 is a manufacturer of windows and doors supplying the company B with windows and doors manufactured specifically for each construction site according to size, noise insulation, and color scheme specifications. There are challenges in this relationship related particularly to the incompleteness of order data and inconsistencies in the updating of the delivery schedules to the construction sites, which hinder the effective operation of this supply chain relationship.

Supplier b1 runs a custom-built information system implemented atop an infrastructure provided by an integrated database. The information system consists of a large number of applications used for supporting the different tasks and organizational functions that all access the data from the same integrated database. At the present both of the parties engaged in this buyer-supplier relationships employ their information systems largely to support their internal processes. In the future, however, the companies aspire to develop their collaboration via the adoption of information systems. For example, the company B has decided to adopt a product design library containing the products of the supplier b1 in order to facilitate the improved specification of the products ordered from the supplier and to amend the difficulties related to the incomplete order data. Hence, while the focus of the companies' information systems development has remained largely within their own boundaries they have now started to explore the possibilities that information systems could offer for supporting their collaboration.

The supplier b2 then is a manufacturer of concrete elements supplying the company B with concrete elements that can be considered as complex products as they are, for example, integrated with customized channeling's for electric cablings. The supplier b2 runs a custom-built information system providing adequate support for the company's operations. The focus of the information system however is clearly more on supporting the company's internal processes. There are no IOS implemented between the companies although automation of transactions and other routine communication has been considered. In this case information system capabilities at both ends of the buyer-supplier relationship can be considered to set their limitations for the development of the role of information systems in the facilitation of the collaboration and the related information exchange between the companies.

To summarize, the buyer-supplier relationships between the company B and its supplier's b1 and b2 emphasize that the internal information systems at both ends of the relationship need to be in good shape to provide support for the collaboration between

the companies. What is more, the cases demonstrate that in addition to the technical aspects of the information systems being in shape they also need to be used systematically. What this means is that the processes generating the data keyed into the information systems need to be in shape and applied consistently to ensure that the data in the systems is up-to-date and complete. Meanwhile, the presence of inaccurate and old data in information systems starts to rapidly deteriorate the benefits that could be achieved through the adoption of IOS and enhanced information exchange between supply chain partners.

Company C and its suppliers

Company C is a part of a shipping company and offers door-to-door container transportation services. The company does not own any road transportation equipment. Instead it procures road transportation services in Finland from a group of small trucking companies (supplier c1). The relationship between the company C and the trucking companies can be characterized as a tight partnership and the company C for example has exclusive right for the use of the trucking companies' capacity. Finland is geographically confined presenting an entry barrier to the market and making the supply of trucks equipped for container transportation inflexible, which then has created the need for the company C to partner with the trucking companies. The services procured from the trucking companies consist of the transportation of containers from harbors to customers' premises and vice versa with no value added services included. The trucking companies have accumulated tacit knowledge of the routines and procedures of the company C and its customers and the collaboration can be considered to be guided largely by established routines.

As for the information systems, the company C uses its mother company's legacy system but there are no information system applications specifically adopted for managing the supplier relationship with the trucking companies. In the case of this particular relationship the information systems used focus solely to supporting the company C's internal processes. The management of the supplier relationship with the trucking companies is handled to a large extent manually and it was commented that one person possessing a solid experience of the driving times and traffic conditions in Finland is able to coordinate all the transportations taking place manually. The trucking companies do not have in use any information systems. For that reason the communication with them is handled mainly via telephone and personal contact when

the trucks pick-up and drop-off containers at the harbors. The company C keeps track of the transportations that it allocates to each trucking company and uses self billing to remunerate them automatically based on the transportations allocated to each company. Hence, there is little need for the use of IOS between the companies as the information exchange between the companies can be handled efficiently via other channels.

To conclude, in this case the trucking companies do not have in use any information systems and while the company C used the integrated information systems of its mother company there were no applications that would have specifically been developed or used to support collaboration with the trucking companies. The information exchange related to the collaboration taking place in this relationship was handled effectively without the support of information systems. While information systems could be adopted in this case to support the collaboration, the benefits could hardly justify the related investments.

Company D and its two customer chains

Company D is a wholesaler of car parts and accessories operating in the highly competitive Finnish car parts and accessories market. Characteristic to the industry is the enormous variety in parts and accessories used in the different car brands and models. Further, the delivery times that the competing wholesalers promise to the customers are extremely short making the management of the car parts and accessories supply chain even more challenging. The company D has implemented a modern ERP system which has been integrated with a CRM package to better support the management of the customer relationships. The information systems provide excellent capabilities for the implementation of IOS and the company exploits these capabilities to a large extent to support information exchange with its customers.

The buyer-supplier relationships selected for examination are a partnership with a retail chain of car parts and accessories stores (d1) and a second tier customer relationship with a chain of car repair shops (d2). The stores of the chain d1 have committed to purchase majority of the parts and accessories from the company D while the members of the chain d2 have committed to use mainly components imported by the company D, thus making them important customers for the members of the chain d1. What is important here is that the company D is responsible for the management of both the chains d1 and d2 consisting of independent entrepreneurs and the company D

provides for the member companies of these two chains administrative services related to for example marketing, information systems, and training of their employers.

The members of the chains d1 and d2 have also been obliged in the partnership agreement to acquire and implement a specific commercial software package designed for the car parts and repair industry. Parts of this software have further been customized to better support the collaboration between the company D and the chains d1 and d2. As a result the company D and the members of the two chains are running a standardized information systems infrastructure across several steps in the supply chain with excellent connectivity and capabilities for supporting collaboration between the companies. This infrastructure is exploited at the moment, for example, to download Point-of-Sale (POS) data daily from the stores of the chain d1 and this data is used to optimize inventory levels and order quantities in the supply chain. The IOS are widely utilized to facilitate information exchange between the company D and members of the chain d1. Meanwhile, although the technical capabilities are in place, the use of the information systems and IOS still varies among the different car repair shops of the chain d2. Further, in addition to the use of system-to-system type of IOS with the chains d1 and d2 to facilitate efficient transaction processing, an extranet system is used to support deeper collaboration between the company D and the members of the chains d1 and d2 and, for example, to distribute reports, documentation and other less structured data.

This case can be considered important as it provides an example of how information systems infrastructure can be standardized across several stages in a supply chain. Here the information systems development has been championed and coordinated by the company D to whom the members of the chains d1 and d2 have largely handed over the responsibility for the development of their information systems. Further, this information system infrastructure was not only exploited for automating the transaction processing between the companies but also efforts were made to leverage the infrastructure to support deeper collaboration between the companies and strive towards the improved management of the supply chain. This case can also be considered to be of interest because the information system integration championed by the company D took place towards the customer direction while typically it has been considered that companies are more easily able to persuade their suppliers than their customers to engage in electronic integration.

Profiles for information systems development and use

In the cross-case analysis the individual cases were compared with each other in order to identify profiles to represent the manner in which the companies develop and use their information systems for supporting collaboration with their supply chain partners. In the analysis the development of information systems and on the other hand the way in which the companies employed the information systems to support their internal as well as the inter-organizational processes between them were examined to identify similarities and at the same time differences between the companies.

As the result of the cross-case analysis three profiles emerged for the focus of information systems development and use in collaborative supply chain relationships. These profiles – *internal foci*, *external foci*, and *supply chain foci* – depicted in the Figure 2 represent how the companies engaged in the eight buyer-supplier relationships examined in this study were found to develop and use their information systems to support collaboration with their supply chain partners. The differences between the three profiles in their process and information systems development focus are next discussed.

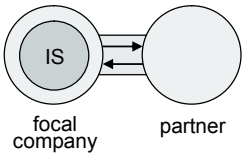
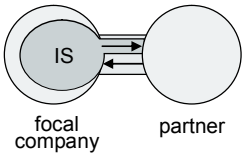
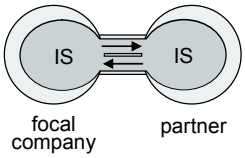
Focus of information systems development and use	**Internal foci**	**External foci**	**Supply chain foci**
			
Process focus	Supporting of internal processes	Supporting of internal processes but in addition also on providing support for managing customer and supplier relationships	Supporting of internal processes but in addition also providing support in a significant manner for inter-organizational processes
Information system development focus	Development of internal information systems	Development of internal information systems but acknowledging also the need for building interfaces to support the adoption of IOS and information exchange with supply chain partners	Development of information systems together with the other members of the supply chain

Figure 2: Focus of information systems development and use in collaborative supply chain relationships

Internal foci represent the information systems development and use by those companies that used their information systems mainly to facilitate their internal processes. Among these companies is the supplier a3, which can be characterized as a small company with limited resources for information systems development. Company

B and its supplier's b1 and b2 can also be considered to inhere in this profile although they acknowledged that in the future it would be important to develop information systems to better support the collaboration as well as to adopt IOS to support information exchange between them. Further, the manner in which the company C employed information systems in the relationship with the trucking companies (supplier c1), positions the company into this profile of information systems development and use.

As for the specific issues highlighted in these cases, the supplier a3 provided an example of how limited resources characteristic to smaller companies can constrain the development of information systems for supporting supply chain collaboration. Buyer-supplier relationships between the company B and its supplier's b1 and b2 then emphasized that in addition to developing information systems also the processes both between and within the companies need to be in shape. In other words, if the processes that produce the data keyed into the information systems are not defined and applied consistently the presence of inaccurate and old data rapidly deteriorate the potential benefits that the information systems could offer. Hence, as emphasized in the prior research it should be remembered that the information system implementation needs to be coupled with the redesign of the business processes both inside and between companies (e.g. Cachon and Fisher, 2000; Clark and Stoddard, 1996; Davenport and Short, 1990; Kulp *et al.*, 2004; Lee *et al.*, 1999).

Meanwhile, in the relationship between the company C and the trucking companies, the support provided by information systems for the collaboration between the companies was considered appropriate for the needs of this relationship. What is important here is that there was not considered to be significant needs to expand the foci of the information systems development and use in this relationship. As the development of information systems requires investments in time, money, and effort their development should not become and end in its self but stem from the needs for supporting collaboration between the members of the supply chain. Hence, companies should carefully assess the needs for supporting supply chain collaboration while considering whether they should expand the focus of their information systems development and use.

External foci represents those companies that developed and used information systems in addition to supporting their internal processes also the supplier and customer relationship management and the electronic transfer of data with their supply chain

partners. In these companies the focus of information systems development could be seen to be on the companies' internal information systems but to take into consideration also the need to support collaboration and the implementation of IOS with the company's supply chain partners.

The external foci represent the information systems development and use in company A and its supplier's a1 and a2. These companies, although the supplier a2 was in the middle of an ERP system implementation, sought to support collaboration and the related information exchange with their supply chain partners via their information systems. Here the relationship between the company A and its supplier a2 also emphasized the impact that long term nature of information system investments has in the supply chain context where the information systems development among the supply chain members seldom takes place at the same time.

Supply chain foci then represents information systems development and use in those companies that employed information systems in a significant manner to support the collaboration and inter-organizational processes with their supply chain partners. In addition to using information systems to support their internal processes these companies employed them also in a significant manner to facilitate collaboration and the related information exchange with their supply chain partners. The focus of the information systems development also extended here beyond the organizational boundaries and addressed the development of the information systems infrastructure together with the other members of the supply chain. Of the cases examined in this study this profile is evident in the way in which the company D employed information systems with its customer's d1 and d2.

Important aspect that can be seen to differentiate the supply chain foci from the other two profiles is the participation of the company's supply chain partners in the information systems development. In other words, while the internal foci and the external foci do not require the active participation from the company's supply chain partners in the supply chain foci the company has to persuade also the other members of its supply chain to partake in the information systems development. This may be driven by the benefits attainable from the joint development of information systems across the individual members of the supply chain or by the power of one or more members in the chain over the others enabling them to compel the others to participate. In the case of the company D and the customer's d1 and d2 it was the company D that championed the development of the information systems infrastructure in the supply chain and

persuaded the members of the chains d1 and d2 to adopt the information systems to support the collaboration between the companies.

To conclude, as the result of the cross-case analysis three profiles were identified that represent the development and use of information systems for supporting collaboration between the companies engaged in the examined buyer-supplier relationships. The profiles differentiate companies from each other taking into consideration how well their information systems development takes into account the supporting of collaboration with their supply chain partners and whether the information systems are focused on supporting the companies internal processes or do they provide support also for the inter-organizational processes extending beyond the companies' boundaries.

4. Conclusion

The objective of this study was to seek profiles to represent the manner in which companies develop and use of information systems to support collaboration with their supply chain partners. The case study approach was adopted for this purpose and used to analyze empirical data collected on the development and use of information systems in eight collaborative buyer-supplier relationships. As the result of the analysis three profiles – *internal foci*, *external foci*, and *supply chain foci* – emerged from the data to represent the manner in which the companies developed and used their information systems for supporting the collaboration with their supply chain partners.

First profile, *internal foci* represent the use of information systems for supporting mainly the company's internal processes with also the focus of the information systems development remaining within the company's boundaries. Second profile, *external foci* represent the use of information systems to support in addition to the internal processes also the management of supplier and customer relationships and the processes extending beyond the organizational boundaries. The emphasis of information systems development, however, still remains largely within the company's boundaries even though the needs for supporting supply chain collaboration by for example building interfaces for the adoption of IOS are acknowledged in their development. Third profile, *supply chain foci* then represent the use of information systems in a significant manner to support the collaboration and inter-organizational processes between the members of a supply chain. The focus of information systems development extends here beyond the

companies' boundaries and addresses the need to developed information systems together with the other members of the supply chain.

The three foci represent the manner in which the companies were identified to develop and use information systems to support collaboration with their supply chain partners. The identified profiles can be utilized by both researchers as well as practitioners as a basis in the assessment and development of collaborative supply chain relationships. Further, the findings of the study emphasize that the expansion of the foci of information systems development and use should not be considered as an end in its self but stem from the needs for supporting collaboration with the company's supply chain partners. Hence, the expansion of the foci should not by any means be considered as a development objective that all companies should strive towards. Nevertheless, companies should be aware of how they are focused in the development and use of their information systems and evaluate whether their current foci address their present as well as their future needs for supporting collaboration with their supply chain partners.

As limitations for the generalizability of the findings should be considered the Finnish context of the study as well as the research methodology adopted for the study. The limitations of the case study approach – the findings being deeply embedded in the context of the study – should be taken into consideration in future research building upon the findings of this study. This said, future research is invited to explore the development and use of information systems in the supply chain context and to test and validate the profiles identified in this study. Particular issues that should receive attention in the future research include the decision making related to and the actors taking part in the information systems development in supply chains. In addition to this also the impact of industry wide information systems and business process development initiatives, such as the RosettaNet, to individual companies should receive attention in the future research.

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