A VALUE-CREATING NETWORK ANALYSIS FROM SOFTWARE BUSINESS

Nina Helander, Tampere University of Technology
Marianne Kukko, Tampere University of Technology

ABSTRACT

Increasing global competition is a driving force pushing toward a networked way of doing business, as companies are forced to search for efficiency through co-operation with other companies. The underlying question is how well the companies combine and co-ordinate their value activities with other companies in order to together create an entity that is able to produce value for the end customer. These kinds of entities – namely, value-creating networks – are the focus of the present study. We explore value-creating networks empirically in a specific, dynamic industry setting. Software business is chosen as the empirical context as it represents a dynamic and contemporary industry. The paper presents an empirical research of a focal net consisted of three types of actors: a focal company building complex software systems to its industrial customers; the focal company's suppliers; and the focal company's customers. The research is carried out as a single-case study. In gathering and analyzing the empirical data qualitative research methods are followed. The empirical findings are reversed to theoretical debate on networks, and as an outcome of the study an empirically-grounded model for value-creating network analysis is presented. Additionally, the paper contributes to literature by increasing our understanding of software business characteristics from network point of view.

KEYWORDS: Value creating, business networking, software business characteristics

JEL: M1

INTRODUCTION

Value as a concept has received increasing research interest in recent years in marketing and management studies. Value and value creation have been given particular focus in the field of consumer marketing, but they have gained increasing popularity also in business-to-business marketing. Studies about value creation largely concentrated on the customer's perspective at first, but more recently the supplier's perspective has been taken into account as well. That has led further, toward studies addressing joint value creation in buyer/seller relationships (see, e.g., Forsström, 2003; Ramirez, 1999).

In business-to-business contexts, value creation has been explored at different levels as well. Value creation has been studied both at the level of dyadic business relationships (e.g., Hirvonen & Helander, 2001; Möller & Törrönen, 2000; Anderson & Narus, 1999; Anderson & Narus, 1998; Lapierre, 1997) and, increasingly, at that of business networks (e.g., Thomas & Wilson, 2003; Möller *et al,*. 2002; Kothandaraman & Wilson, 2001; Wedin & Johanson, 2000; Parolini, 1999). Research concerning value creation at the level of business networks has gained worldwide interest: studies have been carried out among scholars representing different disciplines and theoretical backgrounds, and the phenomenon studied here has been labeled in various ways by the different scholars – as, e.g., value creation networks, value-creating networks, value creation systems, or value systems. However, one area of commonality among these studies is that they have been mainly theoretical in nature. As stated by Ulaga (2001), there is still a lack of empirical studies concerning value creation in networks in industrial contexts. Although there are some recent exceptions – empirically-oriented studies of value creation at the level of business networks (e.g., Svahn, 2003; Törmänen & Möller, 2003; Törrönen & Möller, 2003) – there still exists an empirical research gap, which the present study aims to help fill in its own part. We start the paper by short review on software business literature and move on to present the theoretical framework for studying value-creating networks. Then, the main focus of the paper, the empirical study of a focal net in software business is opened up. In the end of the paper, summary and conclusions are presented.

LITERATURE REVIEW: THE SPECIAL CHARACTERISTICS OF SOFTWARE BUSINESS

The software industry has grown rapidly; keeping pace with the general growth of the ICT cluster, and it has a growing importance as an industrial sector in its own right (e.g., Toivonen, 2002; Rajala *et al.,* 2001; Autere *et al.,* 1999; Nukari & Forsell, 1999). One possible way to capture the essence of this fast growing industry is to divide the software industry into smaller segments, which helps to understand more clearly the different ways of doing business related to software. One rather commonly used way to break down the business is to consider embedded software, professional software services, enterprise solutions, and packaged mass products as involving separate kinds of business, as suggested by Hoch *et al.* (1999). Embedded software refers to programs integrated as inseparable parts of system products that include also hardware other than standard computing platforms. Professional software services refer to the work of the software project business (see, e.g., Alajoutsijärvi *et al.,* 1999) or to tailored software (see, e.g., Tähtinen, 2001), for which the customer organization is usually charged an hourly rate, not a fixed price for the software products or components provided. Enterprise solutions include software that is produced for the needs of customer organizations, which usually are quite specific, based on general technological solutions and often also on standard application frameworks. Lastly, packaged mass-market software refers to software products that are provided as they are to several customers.

However, boundaries between the software product business and project business may not be clear-cut, because companies in the project business are seeking productization while at the same time companies in the product business quite often need to do some kind of customization for their products, in order to meet customer requirements. In fact, the software product and software project business should be regarded as the endpoints of a continuum that includes also combinations of product and project business modes (Sallinen, 2002; Alajoutsijärvi *et al.,* 1999).

In order to shed more light on the software industry, a brief discussion concerning the similarities and differences between the software industry and more traditional industries is justified. The discussion pays particular attention to the issue of whether the software business is something special compared to other businesses or is just business as usual. It may be impossible to find a straightforward answer, but some guidelines can firstly be drawn from the discussion in the literature of information/digital economy versus traditional/industrial economy and high technology versus low technology. Varying views have been presented on this issue. For example, Shapiro & Varian (1999) argue for the similarities of the more traditional economy and the digital economy, when pointing out that although technology changes, the basic economic laws remain the same. As an opposing view, several studies concentrating on analyzing the differences between high-tech markets and low-tech markets (e.g., Gronhaug & Möller, 1999; Moriarty & Kosnik, 1989), between software and hardware products and between the corresponding areas of business (e.g., Rajala *et al.,* 2001; Messerschmitt & Szyperski, 2000), and between the information society and more traditional society (e.g., Parolini, 1999; Shapiro & Varian, 1999) can be found. The different views provide fruitful ground for this research: to some extent, the general theories and models drawn from the industrial marketing and management literature can be applied directly in the empirical context of the software business, although there is a need for some modifications, too, due to the special characteristics of software (cf. Messerschmitt & Szyperski, 2003; Sallinen, 2002; Messerschmitt & Szyperski, 2000).

One major difference between the software industry and more traditional industries is that the software industry is much younger. The industry may not be as ready for structuring in system integrator (SI) -

style marketing channels as the more traditional industries are. For example, the development in Western automotive businesses from competitive supplier relationships toward more stable, closer buyer/supplier relationships has taken several decades. It could be argued that the software industry is not yet ready for SI-type business, in the very essence of the concept. Also, the questions related to product architectures differ between more traditional industries and software-intensive industries: the architecture of physical products is simpler and less abstract than that of software products (Sääksjärvi, 1998). It can be argued that the complexity of product architectures in software-intensive industries could delay e.g. the full utilization of commercial software components.

Another important question is whether the software industry will ever be ready for close relationships between the SI and the component supplier, due to the strong role of knowledge and competence in the buying and selling industries and the abstractness of software. When there are continuous and rapid changes in the industry, predictions of future markets are difficult. This can lead to a situation where the buying companies are not ready to give away any parts of their business because they do not know which part of their business is going to be successful in the future. They may decide to hire more software engineers themselves rather than invest in software supplier relationships.

Such a fear of losing future opportunities can prevent the development of close supplier/buyer relationships: it has been argued that in technologically turbulent industries, such as the ICT cluster in general, neither the suppliers nor the buyers want to become deeply engaged with any specific partner. However, the high turbulence often also means scarcity of resources in times of heavy demand for end products, and in such cases, it might be worthwhile to take the risk of trying to develop more co-operative relationships. Due to this it is valuable to make a research on value-creating network in software business.

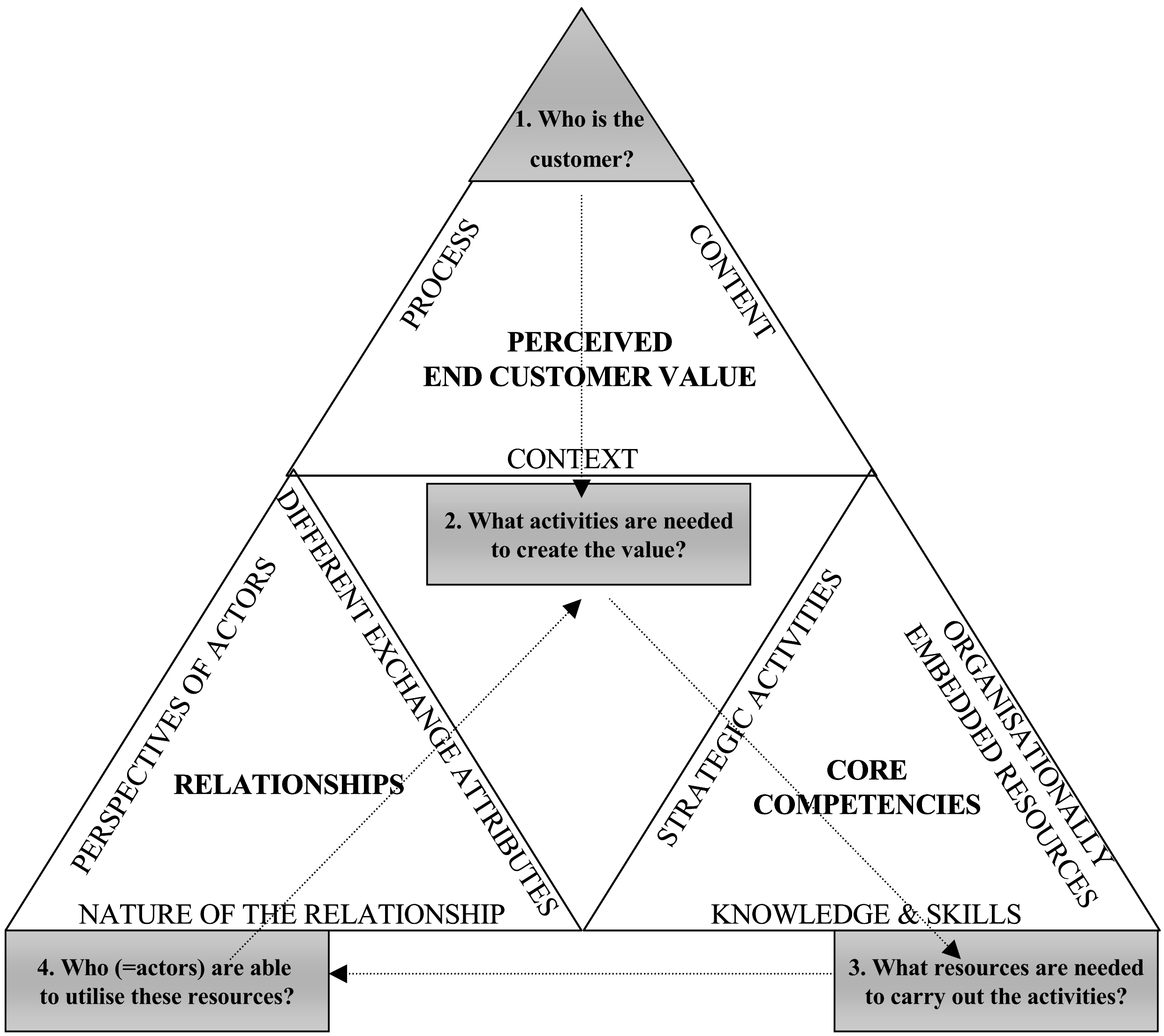
THEORETICAL FRAMEWORK OF THE STUDY

By reviewing earlier research on value and value creation, one can identify a shift from studying value creation at the level of relationships (e.g., Storbacka et al., 1999; Donath, 1998; Lapierre, 1997; Storbacka & Lehtinen, 1997; Donath, 1996) toward studying value creation at the level of networks, nets, and alliances (e.g., Möller et al., 2002; Kothandaraman & Wilson, 2001; Möller & Törrönen, 2000; Parolini, 1999; Doz & Hamel, 1998). One possible reason for such a shift might be the notion of the important relationship between one's own core competencies and the reasonable ways, and number of ways, to try to create value for the customer. In other words, it is not usually reasonable to try to create value for the customer just through the firm itself and its limited competencies if there is the option of allying with other firms that can complement the existing competencies in order to together create superior customer value. For the allying, functional relationships need to be developed and managed. These concepts of value creation, core competencies and relationships, are seen in the present study as elements that together form a framework that can be used in analyzing value-creating networks. The framework is presented in Figure 1.

Based on a theoretical review of network and alliance literature, we argue that customer perceived value is the reason for building networks and matching competencies – without the customer, there is no point in forming relationships in which competencies are joined in order to create value. What the end customer perceives as valuable defines what kinds of competencies are needed in creating the value. Furthermore, the relationships between the network actors are formed based on who is able to utilize the competencies required. In the end, the value is created through the relationships between network actors, and thus the nature of the relationships affects the value outcome. In next, these three interconnected elements are opened up in more detail.

Value itself is one of the most important elements to understand in the analysis. Several definitions can be found in the literature, and in some works, the concept is not precisely defined. This first element of our framework highlights the role of the end customer as the actor determining what kind of value the network should strive to create. Furthermore, the term 'perceived' that we use in our framework refers to the basic nature of value for the customer – the value created by the network is measured in the mind of the end customer. This leads to the fact that the value created is in most cases hard to measure.

Figure 1: Theoretical framework to study value-creating networks (Helander 2004)



This figure presents the connection between the perceived end customer value, the core competencies and the relationships. The perceived end customer value defines what kinds of competencies are needed. The value is created through the competencies of network actors and within the relationships between the actors.

The content, process, and context views can be used as tools to better grasp the value created by the network. The content view emphasizes that value should be measured as the trade-off between benefits and sacrifices that are not only monetary but also non-monetary. The process view emphasizes that value is not merely tied to the actual object of exchange, such as a software component; instead it is dependent on the successfulness of the whole relationship between the customer and the supplier. The context view, for its part, puts forward the notion of differential value: the network should be able to create more value than the end customer could achieve by choosing some other solution created by another, competitive network.

Core competencies can be viewed from several angles, too. A good starting point for the discussion of core competencies is the work of Alajoutsijärvi & Tikkanen (2000), who bring up the relation between competencies and value created for the customer. In their work, they combine three theoretical discussions addressing organizational competencies, business processes, and industrial networks, and they define a core competence as something that 'refers in its most general sense to an organizationally embedded capability that can create differential value through a chain of activities that a customer is willing to pay for' (Alajoutsijärvi & Tikkanen, 2000). Thus, the role of the customer is emphasized in this definition, while it is others' role to see that it is, ideally, delivered something that the customer values as useful and is at the same time difficult to get from other sources. In fact, the degree to which core competence is distinctive depends on how well endowed the company is relative to its competitors and how difficult it is for competitors to imitate its competencies (Teece et al., 1997).

In this study, core competencies are discussed through consideration of organizationally embedded resources, strategic activities, and knowledge and skills, which have been key themes in theoretical discussion about competencies and capabilities (e.g., Alajoutsijärvi & Tikkanen, 2000; Seppänen, 2000; Sanchez & Heene, 1997; Prahalad & Hamel, 1990). Building upon these literatures, a corresponding definition of 'core competence' is provided in this study: core competencies are resources that are organizationally embedded and activities that are strategic in nature. They are knowledge and skills that enable creation of differential and superior value for the customer. Although core competencies are organizationally embedded, they should be regarded as free from exact organizational boundaries in a value-creating network context. In other words, the emphasis is on competencies that the focal network actor is able to utilize, not on competencies that the actor possesses.

In discussing both the concept of value and that of core competencies, the concept of *relationships* is inevitably mentioned. Relationships form the third of the interrelated elements of the framework. Relationships are the foundation of any network analysis, as networks consist of several direct and indirect relationships, but their role as an interlinking element in a study of value-creating networks is even more important: the way in which the value is created is influenced by the nature of the relationships that the network actors have with each other. Therefore, the types of relationships that exist between network actors and changes in these relationships affect the value creation in the business network.

There are several different but interconnected angles for considering business relationship as a concept. For the analysis of value-creating networks, there are three angles related to business relationships that are given more careful consideration: different exchange attributes, the nature of the relationship, and the perspectives of the actors. The different exchange attributes that will be part of the analysis of relationships in a value-creating network are product (and service), information, social exchanges, and financial exchanges. These attributes are closely related to the issue of the nature of the relationship, as the amount and weight of different exchanges vary with the type of relationship. For example, the amount and import of social exchange is more evident in partnerships than in more transactional relationships. The nature of the relationships refers to the different types of relationships as regards their closeness, the relationship's degree of balance, and legal bonds. The phase in the relationship's development can serve as another potential classification criterion. However, the stage of development is not taken into account in this study in detail. On the other hand, the different actor perspectives are included in the analysis in order to provide a more multifaceted and holistic view for value-creating network analysis.

To summarize the discussion about relationships, in our framework, the concept of business relationship refers to a chain of interaction between two organizational parties. During the interaction, different attributes are exchanged for each other. Relationships in a value-creating network context can be viewed from different actor perspectives – e.g., those of the end customer, system integrator, supplier, and intermediary. Different types of relationships can occur between the network actors, depending on the nature of the relationship. One can apply classification criteria such as the closeness of the parties; dominance or balance between the members of the network; and the role and weight of different relationship connectors, including information, social ties, and legal bonds between the parties involved. Additionally, the nature of the product/service under exchange influences the nature of the relationship and its stages of development.

It needs to be pointed out that through the three core elements – value, competencies, and relationships – the elements of actors, resources, and activities are present in the framework, too. The latter three elements are familiar from the ARA model (see Håkansson & Johanson, 1992). It can be argued that it is even impossible to talk about relationships if there are no *actors* – i.e., parties participating in the relationship. Moreover, relationships usually exist for exchange of resources between the parties in the relationship. Additionally, as relationships are identified through interaction events, the notion of activities is already there. The existence of actors, resources, and activities is also inherent in and linked to the elements of value and core competencies, as core competencies were defined as organizationally embedded and strategic *resources* that can create differential *value* for the customer when they are created and used through a chain of *activities* that are carried out by the network *actors*.

In fact, we argue that it would be virtually impossible to carry out a value-creating network analysis without utilizing the concepts of actors, resources, and activities, because as the starting point for a value-creating network analysis is to identify the value created for the end customer, and as the value is something that is *perceived* by the end customer, the end customer as an important *network actor* needs to be identified at the outset. Afterwards, the identification of the *activities* that are needed for the specific value creation in question need to be identified, leading to identification of the *resources* that are needed for carrying out the value-creating activities. These 'steps' are also included in our framework, presented in Figure 1. The interconnectedness of these elements is highly visible. For example, the elements of perceived value to the end customer, core competencies, and relationships are interconnected in nature also when changes occur: a change in one element usually causes changes to the other two elements. For example, if changes in the end customer's appreciation of the value created occur, a different kind of value must be created, and this may require different kinds of competence. Moreover, if the network and the relationships constraining it are built upon and structured by the logic of joining the core competencies of different actors together, changes will occur in the relationships, too.

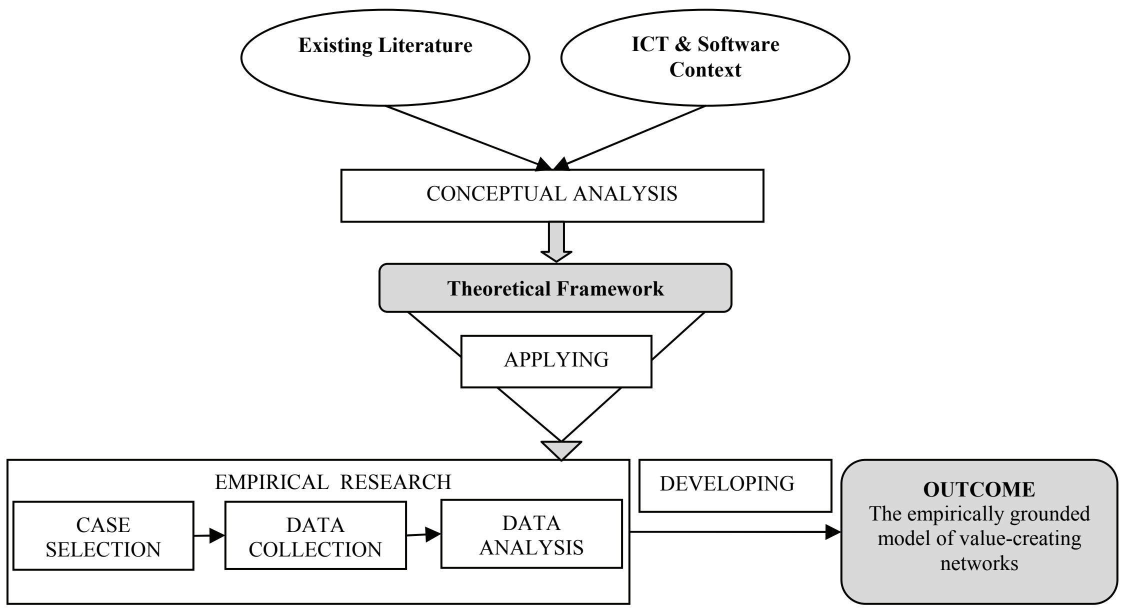
THE SCIENTIFIC APPROACH AND RESEARCH METHODS

On the subjectivist/objectivist continuum of social science research presented by Burrell & Morgan (1979), the present study is positioned toward the subjectivist side. The aim is to interpret and understand the phenomenon under study rather than to arrive at law-like generalizations. The aim is to gather first-hand knowledge and to achieve understanding from inside rather than from outside, by utilizing qualitative research methods. Thus, this research follows idiographic research methodology, as opposed to nomothetic research methodology (see Pihlanto, 1994; Neilimo & Näsi, 1980; Burrell & Morgan, 1979).

Closely related to the research methodology is the choice of inductive and deductive ways of drawing conclusions and building theories; induction is based on empirical evidence, whereas deduction is based on logic. In other words, a researcher applying induction draws theoretical conclusions based on empirical observations while deduction involves formation of hypotheses based on laws and theories before testing of the hypotheses by gathering facts. Although these seem to be opposite approaches, they can both be utilized in the same study. (Ghauri *et al.,* 1995) In fact, although one aim in this study is to add to the general knowledge on value-creating networks, based on findings from the empirical data, information on and a framework for considering such new aspects as are needed in studying software-intensive industries – and the software business in particular. Due to this, this study cannot be labeled purely inductive, but there are also deductive characteristics present because the empirical data are viewed in a certain theoretical framework.

Additionally, Alasuutari (1995) discusses the cyclical movement between theoretical and empirical considerations in qualitative research when he distinguishes between movement to a local explanation from a theoretical framework and vice versa, from a local explanation to theoretical ideas. The theoretical and empirical parts of this study are in a dialogue: the empirical information is analyzed through the developed framework that bases on previous research, but then the framework is revised based on the findings and new ideas emerging from the empirical material. The dialogue between the theoretical and empirical viewpoints forms the core of the research strategy of the present study. Figure 2 illustrates this research strategy.

Figure 2: Research Strategy of the Study



This figure presents the research strategy of the study. The figure presents how the study is carried out by dialectics of induction ad deduction. The existing literature and software context have been the starting point of the study. Through the developed theoretical framework the empirical data is analyzed and new knowledge has been gained. As a result, a model of value-creating networks has been created.

This empirical research is carried out by following a single-case strategy. In gathering the empirical data and in analyzing the data, qualitative research methods are followed. According to Yin (1994), a case study strategy is appropriate when the research problem is of the 'how' or 'why' type. As the present study has an interpretative orientation and aims to understand and interpret the phenomenon from inside rather than outside, also the research problem of the study represents a 'how' form. Furthermore, as the phenomenon of value-creating networks is a contemporary one; it is investigated within its real-life context; and the boundaries between the phenomenon and context are not clearly evident, the case study strategy was a suitable research strategy to adopt. (Yin, 1994)

As already stated, this study has been carried out by qualitative research methods. The choice of qualitative methods is natural, as these are the most suitable research methods when the objectives of the study demand in-depth insights and the aim is to understand the target phenomenon. Additionally, as the present study deals with network analysis, for which a holistic perspective is characteristic, the choice of qualitative methods is all the more appropriate.

METHODOLOGY

The studied case is a focal net consisted of three types of actors: focal company building complex software systems to its industrial customers; the focal company's suppliers; and the focal company's customers. The core competencies are analyzed from each of these three actor perspectives, thus the analysis takes into account both the demand and the supply side of competencies. Additionally, the relationships between the actors are analyzed.

The focal company analyzed in this study can be labeled a high-tech company that operates in the electronics-manufacturing-equipment industry. The company operates in business-to-business markets, providing its organizational customers with a wide range of devices and larger automated production systems based on integration of computing into electromechanical components and products; i.e., the company under study is a typical example of an SI operating in a software-intensive industry. Overall, the focal company is a fruitful example of an SI operating in the ICT cluster, as it can be seen to represent not only the electronics-manufacturing sector but also the industrial automation sector. Moreover, through its main customer base, the company is closely linked to the telecommunications sector, too.

As stated above, the focal company has concentrated on serving customers operating in the telecommunications sector, both large original equipment manufacturers (OEMs) like Sony-Ericsson and Nokia and their contract manufacturers (EMSs), like Flextronics and Elcoteq. However, in the past years, the company has started to search for new customer industries and sectors as well, mostly due to the difficult market situation that has continued in the telecommunications sector. Additionally, the focal company has not always been an SI providing total system solutions. Rather, it started as a pure device supplier, but in recent years it has started to move toward providing entire system solutions, automated production lines. This shift has led the company toward the role of a system integrator that utilizes the newest hardware solutions as well as leading-edge software technology. The shift from device supplier toward system provider has not, however, been easy, as the employees of the company, and especially the salesmen, have not always understood the different business logic that is required in order to be a genuine system provider instead of a device supplier. This lack of knowledge and new situation has been causing several problems not only in the company's customer relationships but also in supplier relationships and within the focal company itself. Moreover, the transformation has been complicated by the decreasing number of employees caused by economic hard times.

The focal company still provides single devices to its customers, but the role of system deliveries is nevertheless growing. What can be called a system delivery is, according to the interviewees, a delivery of a production line that includes not only robotics and all the necessary hardware but also software that manages the entire production line. In this study, the focus is on the software solution that has been developed by the focal company and is provided as an essential part of the total system delivery. Thus, sales of single devices are left out of the scope of this research.

The focal company started to develop the software solution in order to respond to the growing needs of its customers to shorten the ramp-up time of their production and speed up production, leading to the increasing importance of order-to-delivery process management. The software system the company developed enables flexible production processes by making it possible to create and modify production orders, and it allows simultaneous control of production orders without stopping production. This brings flexibility to the customer's production, by providing the chance to use a single production line for both mass and custom production. Thus, no separate production lines for different product variations are necessary and the customer is able to achieve savings in line investments and in floor space, and to have shorter production times.

The focal company designs all the software that is needed in the system solution, but most of the actual software development and implementation work has been acquired from three Finnish software suppliers. These suppliers have been operating mainly as subcontractors, by charging the focal company at an hourly rate, although recently there has been a strong shift toward acquiring the needed software from the suppliers more as components than on a resource-based subcontracting basis. Besides these three main suppliers of software, the focal company has a few other software suppliers and a greater number of suppliers of hardware. These hardware suppliers are not dealt with in more detail in this study because the focus is on studying software and business built around it. Figure 3 illustrates the area of research in this focal net study.

Figure 3: Illustration of the Research Area of the Focal Net Study

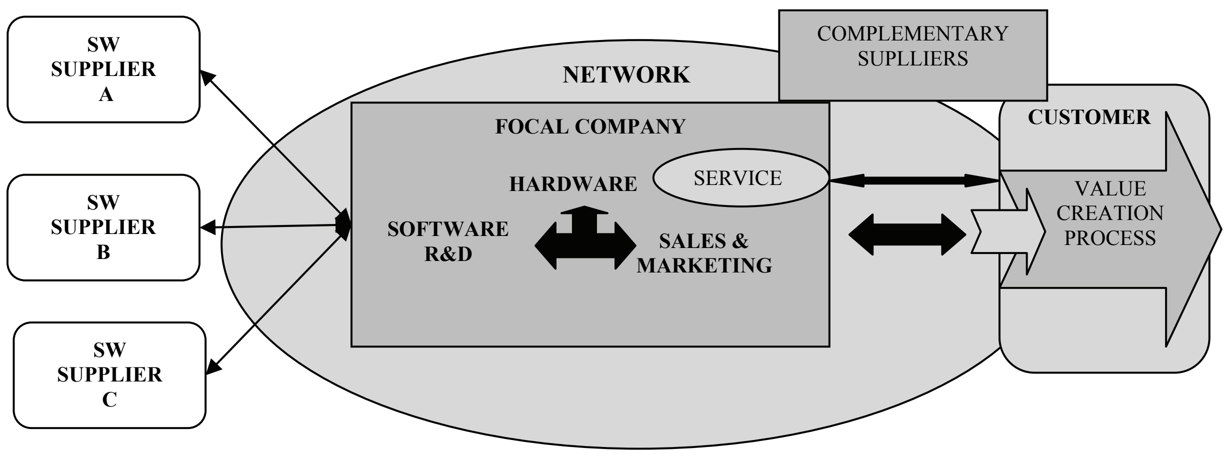


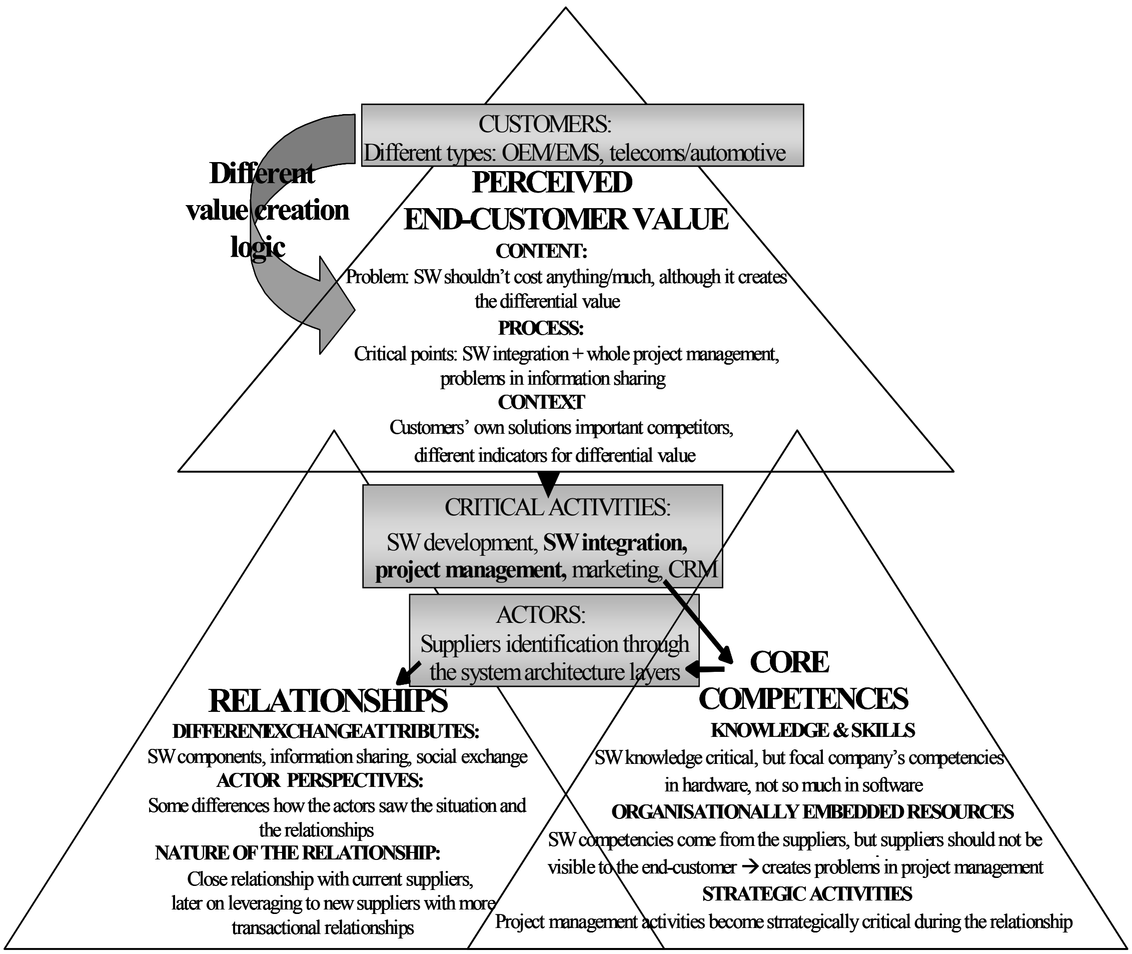
Figure 3 illustrates the context of the research. In the figure the main actors (focal company, its suppliers and its customers) and the relationships between them are illustrated. Through these relationships the value creation process of the customer is supported.

In the middle of the figure is the focal company. For purposes of this study, software R&D has been identified as one of the main functions of the focal company to be studied. However, because the company is providing total system solutions to its customers, also the role of hardware needs to be taken into account at a general level. Additionally, sales and marketing are important functions to consider in deeper analysis. Customers are shown at the right side of the figure. All the customers of the focal company are industrial customers that buy products and system solutions from said company in order to facilitate their own production; i.e., they do not buy products/solutions from the company studied for further sale as part of their own product. In the figure, the value creation process of the customer, and the buying process (that is, the acquisition process) as an inseparable part of it, are identified. On the left side of the figure, the three main suppliers of software have been identified as their own group. As stated above, the focal company has other suppliers as well, but they are not relevant enough from a software standpoint to take into account in the analysis. The suppliers, customers, and focal company itself form part of a broader network that is also illustrated in the figure. However, rather than to study this larger network, the aim is to study more carefully the focal net of the company through examining the level of the relationship portfolio consisting of both the suppliers and the customers of the company.

EMPIRICAL FINDINGS

The focal net level of analysis provided interesting insights concerning the value creation problematic in business networks, although the scope of the analysis was limited to a particular focal net. In here, the key findings are provided. The presentation of the key findings is started by introducing a figure showing the value-creating network framework with the key findings positioned in it (see Figure 4).

Figure 4: Key Findings of the Case Study



The figure depicts the key findings of the study. Identification of different customer types and their value creation logic was the starting point of the analysis. Content, process and context perspectives on end-customer value were analyzed. This led to guidelines for identifying the critical activities of the focal net. The next step was to determine what kinds of resources and core competencies were needed to carry out these critical activities. The system architecture dictated to a rather large extent the division of labor and responsibilities of the different suppliers.

Identification of the different customer types served by the focal net was an important starting point for the analysis, as the value creation logic of the different customer groups varied, an example being the varying business models of the OEM and EMS companies. However, all customers interviewed, regardless of the customer group they represented, undervalued the role of software in the focal system solution, as they weren't ready to pay so much for software, even though the software provided most of the added value for them. As regards the process perspective on perceived end customer value, the biggest shortcomings were in the software integration and overall project management phases. From the viewpoint of the customers, the most problematic matters were the information sharing and forced interaction with several actors, as their desire was to just interact with the focal company. The context perspective on the perceived end customer value was rather interesting in the focal net being examined, as there were only a few competitors that would have been able to provide differential value for the end customers as competing solutions to the focal system solution. However, the customers themselves had in fact developed system solutions competing with that provided by the focal company. In order to defeat such an internal competitor, the focal company should have developed arguments that clearly indicate what kind of differential value the focal system solution can provide. The component-level tracking ability is an example of such an argument.

Identification of the perceived end-customer value also led to guidelines for identifying the critical activities of the focal net. In this case, the most critical activities were software integration and project management, but also CRM, marketing and software development were rather critical. The next step was then to determine what kinds of resources and core competencies were needed in order to carry out these critical activities as successfully as possible. In this case, the focal company did not posses enough software development competencies, and the importance of the software suppliers within the focal net increased. However, this increasing role of the suppliers within the focal net was rather problematic, as the end customers did not want the suppliers to be visible in their relationship interface with the SI. This led to an even more critical and strategic role for the project management activities of the SI.

The system architecture dictated to a rather large extent the division of labor and responsibilities of the different software suppliers within the focal net. The various suppliers saw their reciprocal relationships rather differently, although they all had rather similar viewpoints on the nature of the relationship with the focal company and, furthermore, with the end customers. In practice, the nature of the different relationships did vary. Through the different exchange attributes, consisting of information sharing, social exchange, the object of exchange, and legal and operational bonds, the nature of these relationships can be explained.

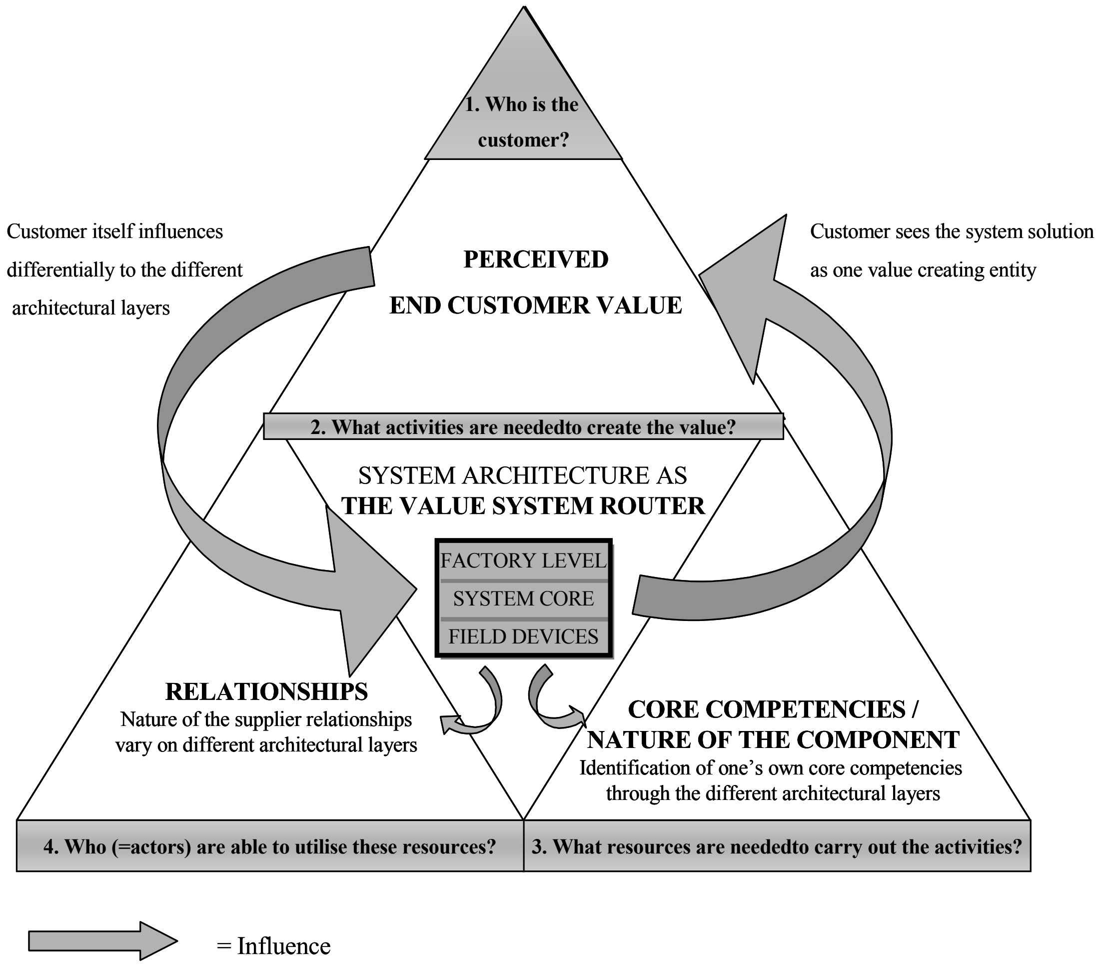
As the informants expressed the value created for the end customer, their core competencies and those of their supplementary suppliers, and the nature of the supplier relationships through the concept of system architecture, the value-creating network and its interconnected elements (perceived end customer value, core competencies, and relationships) must be mirrored through the concept of system architecture in the context of the software business. For that reason, the heart of the empirically grounded model was added a fourth element, the system architecture (see Figure 5).

Thus, the system architecture establishes the layered framework for integrating different components and sub-parts in order to build an effective total system solution for the end customer. Based on the empirical findings, system architecture acts as a value system router, as it gathers value streams from several suppliers at different system layers and then leads the value stream through the integration process to the end customer, which sees the system solution provided as being one value-creating entity. Thus it acts as a funnel for competence input and output. Although system architecture is not a new concept or area of consideration in the fields of technology and industrial management, its role both as a rationale for the specific value network structure and as a tool for understanding actor positioning, competence linking, and supplier portfolio management has not been taken into account in earlier studies.

The system architecture is thus the single most specific feature of the software business that influences the structure of value-creating networks. However, there were also other specific features of the software business that were found to influence the structure of the value-creating network through the elements of perceived end-customer value, core competencies, and especially the element of relationships. These features are somewhat related to the special nature of software as the object of exchange.

As regards the element of value as perceived by the end customer, software as the object of exchange presents difficulties for the network actors in identifying and articulating the value created by the software. In the eyes of the end customer, it doesn’t really matter whether the software included in the system solution is developed in traditional projects priced by the hour or as software components, as the end customer in all cases assumes that the functionality of the overall system solution is the SI’s responsibility, and demands this. However, as software is an intangible product that is valued in terms of what it does, the perception of value on the part of the end customer is related more to the process value added than to the product value added.

Figure 5: The Empirically Grounded Model of Value-Creating Networks Related to the Software Business



In the model of value-creating networks, the special characteristics of software business are visible especially in the form of the system architecture, which has been added as a fourth element to the model besides of the perceived end customer value, core competencies and relationships. The system architecture acts as a value system router through which the value is created to the customer and both the competencies and the relationships are managed.

In a similar way, the element of core competencies is characterized in the software business by the intangible and knowledge-intensive nature of software as the object of exchange. Software is a very knowledge-intensive object of exchange, and the successfulness of software can be argued to be more dependent on the individual's competencies in creating the code than is the case with, e.g., more physical goods. For example, software componentization has been seen as a way is to diminish the danger of losing important competence when a software coder and his/her tacit knowledge leave the company. However, even with software components there remains the demanding task of integration and architecture design; thus, the role of people cannot be diminished even by utilizing software components.

Based on the empirical findings, the nature of the software and the core competencies of the network actors are closely connected to each other, as componentization of software is one way to try to codify the tacit knowledge. Although documentation created during software development has the same aim, software componentization goes one step further. Additionally, the connection between the nature of the component and the competencies was seen through the generality of the component: it is a demanding task to develop general components, but when a supplier is competent enough to develop one, it can enter wider markets in which it can become the critical supplier for many SI companies.

However, the specific features of the software business are particularly visible in the element of relationships, as the significance of the different relationship connectors is clearly emphasized, especially in terms of the information sharing and IPR issues as the legal bonds. The significance of both of these relationship connectors is derived, again, from the intangible and knowledge-intensive nature of software as the object of exchange. To take an example, in the software business the legal agreements on what is done with the source code are important. It is possible for the supplier to retain all control of the source code and then suddenly go bankrupt, leaving the SI in big trouble if the supplied software plays a critical role in the system solution and the SI doesn't have rights to get the source code from the supplier.

In summary, the specific character of software as the object of exchange influences what kinds of relationships the SIs and, on the other hand, the suppliers are willing to develop. From the SI's point of view, the three most important questions related to software are 1) how *critical* the software is for the overall functionality, 2) if there is a need for *modifications*, and 3) how closely *related* that specific software program is *to the core competence* of the buyer. The answers to these questions usually determine how important such other supplier software related matters as IPRs, documentation, testing, quality, and maintenance services are. Furthermore, the answers determine much of what is required of the suppliers and also the nature of the software acquisition process, including, e.g., evaluation of potential suppliers. For example, if the software is not that critical for the SI, evaluation of the potential supplier may be less involved, and the software can even be bought from a company that sells the same software to competitors, too.

DISCUSSION

The result of the study, the empirically grounded model of value-creating networks contributes to the industrial network research tradition. Studies dealing with value creation in inter-organizational relationships, at the level of both dyads and networks, have gained increasing attention from industrial network researchers in recent years. The number of studies that have *empirically* dealt with the value creation phenomenon at the level of *dyads* has been far greater than that of empirically oriented value-creating *network* studies. The present study goes some way toward redressing this lack of empirically oriented studies about value-creating networks by providing a local theory that is grounded in the context of the software business. This contribution can be considered via the question 'What is new in the conceptual basis for the empirically grounded model of value-creating networks?'

Studies concerning technology, high-tech markets, and even the software business from the industrial network perspective are not a new thing for IMP Group researchers. However, the present study has delved more deeply into the technology and software industry, as it has also examined even as technical an element as the system architecture actually is. In fact, the main theoretical contribution of this study can be argued to be *the identification of the influence of the system architecture* as one major factor affecting the structure of the value-creating network. *In the previous literature concerning value creation and industrial networks, such a viewpoint centered on the system product has not been taken into account in as much detail.* Based on the empirical findings of this study, it can be argued that this element has quite an important influence on the network structure. If it is omitted from the network analysis of a software-intensive industry, the outcome may differ considerably from that of analysis that does include such an element. This is because in order to manage the complex process of software development, software companies have been forced to develop and implement product-line architectures that allow a more precise structuring with respect to where and how the different pieces of software should be positioned. This is clearly the case in system products and system solutions because usually they are such large and complex entities that they need special tools in order to be manageable.

The importance of understanding the concept of system architecture in a value-creating network, however, arises from its role as a *value system router* that has multiple effects on the value-creating network. These effects and roles were already examined in more detail, but as a brief summary, the significance of the value system router for the whole value-creating network was identified through its role as an end customer value filter and integrator, as a tool for identifying the network actors' core competencies and actors' positions in the network, and as a tool for supplier network management.

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BIOGRAPHY

Nina Helander PhD (econ.) is a Senior Researcher and Lecturer at Tampere University of Technology. Her research interests are related to business relationships, networks and software business, in particular software components and open source software from a managerial point of view. Helander has publications on value creation, business networks, software component business and open source software. In her doctoral dissertation, Helander studied software business from value-creating network perspective.

Marianne Kukko (M.Sc. [bus.adm. and econ.]) is a PhD student in Tampere University of Technology. She is doing her dissertation about a software company shifting its product development to componentization. Her research interests lies mainly in knowledge management and change management.