

Developing Competences Designed to Create Customer Value

*Anna Lund Jepsen
Svend Ole Madsen*

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Anna Lund Jepsen
Department of Environmental and Business Economics
University of Southern Denmark
Niels Bohrs Vej 9-10
DK-6700 Esbjerg
Tel.: +45 6550 1511
Fax: +45 6550 1091
E-mail: alj@sam.sdu.dk

Svend Ole Madsen
Department of Environmental and Business Economics
University of Southern Denmark
Niels Bohrs Vej 9-10
DK-6700 Esbjerg
Tel.: +45 6550 1512
Fax: +45 6550 1091
E-mail: som@sam.sdu.dk

Abstract

This paper focuses on how small, specialized suppliers can gain competitive advantage by acting as a potential for their scale intensive producing customers in achieving competitive advantage. Of special interest is how a shared understanding of 'value' for the customer is obtained, transferred and implemented in the specialized supplier's production of process equipment. The study draws on theory on networks and specialized suppliers as well as interviews with key informants in three specialized supplier companies for the aluminum industry. An important finding is that the constellation of the specialized supplier's network changes as the project moves from planning to production. With these changes, the role of specialized suppliers in the value creation process also changes. It seems to be an important competence for small, specialized supplier to be able to draw on and manage this network in their value creation process.

Table of contents

Introduction	7
The specialized supplier's relations to other firms	9
Transfer of knowledge about the customer's value creation	12
Methodology	15
Findings	17
The specialized supplier's value network	22
Discussion and implications of the findings.....	24
Future research	26
References	28

Introduction

Competition is dynamic. Not long ago, firms competed against other firms bilaterally. Today, this picture has largely been replaced by a ‘No business is an island’ [Håkansson and Snehota, 1989] mind set in which value chain competes against value chain. To improve competitive power chains are constantly re-structured entailing redistribution of tasks, development of competences inside the firms in the chain, and new forms of cooperation. To the individual firm, the new structure in competition demands constant adaptation of upstream- and downstream relations. To small and medium sized firms, the need to develop and maintain relations is especially crucial, as their customers are often larger and more powerful than they are.

Small and medium sized enterprises (SMEs) are important for the economy as they play a crucial role in growth and technological development for their partners and for society in general [OECD, 1993]. SMEs are characterized by ‘resource poverty’ [OECD, 1993:1; Wong and Radcliffe, 2000:493]. Therefore, it is especially important for such firms to use their innovation competences in a way that enables maintaining their position in the value chains of which they are a part. Great effort has been put into understanding SMEs external relations. Nonetheless the area appears to be characterized by great ambiguity [Hoffmann et al., 1998:39] as there seems to be a tendency that SMEs use external linkages extensively – ‘but with whom are these linkages formed, of what type, with what purposes, etc. remain largely unanswered questions’ [Hoffmann et al. 1998:40]. There is thus still a need to enhance the understanding of the linkages that SMEs engage in.

One type of linkage is the relations that a specific type of small or medium sized firm called specialized supplier engages in. Specialized suppliers supply process equipment to scale-intensive companies and are ‘generally small, and provide high-performance inputs into complex systems of production ...in form of machinery, components, instruments and (increasingly) software’ [Tidd et al., 2005:174]. The relation between specialized suppliers and their custom-

ers is a typical SME relation in the sense that the specialized supplier typically is a SME selling to a much larger customer. At the same time, the relation is not typical for the SME relations that have been studied in previous research because the specialized supplier is not part of the customer's value chain. This is because the good that the specialized supplier delivers is a good that does not become a part of the product that the customer produces. Instead, specialized suppliers are related to the 'ordinary' value chain as an external supplier of the support activity 'technology development' which may also influence 'firm infrastructure' – another support activity [Porter, 1985]. In large scale production, the purchase of production equipment is an important decision ('new task' as defined by Robinson, Faris and Wind [1967]) because the production equipment determines possibilities for production and thus which products that can be offered to the market for a long period in the future. Purchase of production equipment can thus be classified as strategic decisions because they are 'important to the future activities and survival of the organization' [Nielsen, 1991:29]. Håkansson and Waluszewski [2005:112] support this by stating that in today's world a 'physical resource that is of great importance in the product creation process is the production facility'. In consequence of this, it is important that the specialized supplier thoroughly understands how the production equipment that they deliver is connected to the core competences of their customer.

The specialized supplier thus has to understand the value chain that their customer is a part of. This means that the specialized supplier has to be knowledgeable not only of the production process but also of the kind of materials, components, IT-systems etc. that are to be used in the production, and how their customer turns this into value for his customer. The production equipment that specialized suppliers deliver to customers operating with large scale production should, accordingly, be not just products that are able to produce as requested, but solutions that are able to create value for customers. Being able to do so is a core competence.

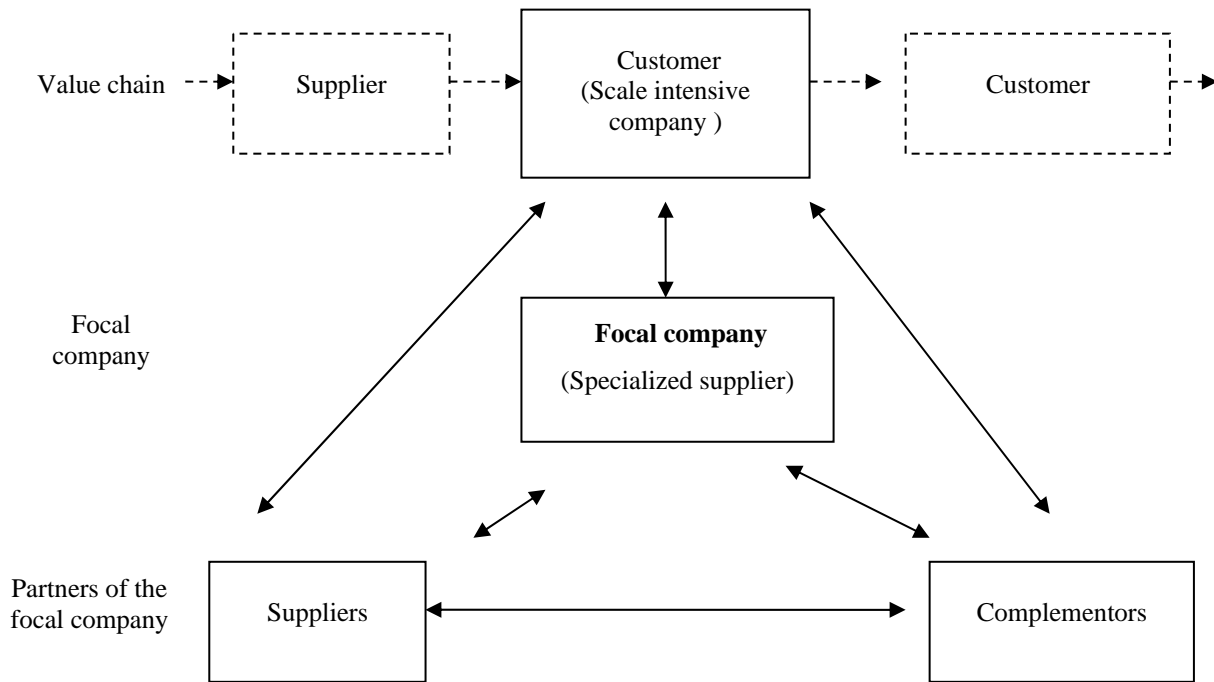
That the understanding of creation of value as a result of efficient production processes is an important core competence in today's society is underpinned by the following facts: The number of people that are employed in the Danish manufacturing industry has decreased with up to 20,000 per year during the last 5 years [Statistics Denmark, 2004]. A common explanation for this is that many firms are outsourcing activities to countries with low labor costs. However, the Danish Economic Council estimate that only 5,000 lost jobs can be ascribed to outsourcing while the remainder (15,000) is lost because of automation and more efficient production processes [Danish Economic Council, 2004]. Efficient production processes thus appears to be an important prerequisite in the global competition of today and the ability of specialized suppliers to develop equipment for these processes accordingly play an important role in firms' ability to maintain their competitive position. From the perspective of the individual SME trying to exploit its scarce resources, it is, of course also interesting to understand how such firms, in interplay with their customers, are able to support these customers' value creation process and hereby enhance their own competitiveness.

Despite the good reasons put forward in the above for improving the understanding of how specialized suppliers enhance their ability to create value for their customers through relations not only to customers but to their entire value chain, only a limited amount of research has looked into how specialized suppliers go about in grasping how the process equipment that they produce can enhance the value of their customers' products. It is, therefore, the aim of this paper to increase this understanding. To do so, we draw on theory about networks and interaction between scale intensive companies and specialized suppliers as well as interviews in companies that are specialized in delivering production equipment to companies in the aluminum industry. Because of the limited knowledge in this field, the study is explorative in nature.

The specialized supplier's relations to other firms

The relations of a firm can be defined from several perspectives. Anderson and Naurus [1991:96] emphasizes that partnership relations between firms can be understood as ‘a process where a customer firm and supplier firm form strong and extensive social, economic, service, and technical ties over time, with the intent of lowering costs / or increasing value, thereby achieving mutual benefit’. Relations are thus not static, but are developed in a continuous process over time. As a result of this, a firm is able to become part of a number of different relations with stakeholders (partners). These relations can be activated depending on the specific project in question determined for creating value for the customer. The principal relations and actors are displayed in figure 1 which is inspired by Ritter et al. [2004]. The focal company (the specialized supplier) is situated in the middle of the network with relations to the customer, to suppliers, and to complementors. Suppliers and complementors are distinguished in the following way: A *supplier* is a firm from a different industry that supplements the focal company’s competences whereas a *complementor* is a firm operating in the same industry as the focal company that complements the competence profile of the focal company. In figure 1 relations are represented by arrows between the firms that make up the network, and according to Ritter et al. [2004], all firms are, in principle, interrelated.

Figure 1. The specialized supplier's relation to the value chain and partners



Inspired by Ritter et Al. [2004] – the boxes and arrows with dotted lines are additions to the original model. Competitors are omitted.

Figure 1 illustrates that the focal firm is related to other firms via several bilateral relations (*dyads*). In total, the focal firm's relations form a *portfolio of dyads*, each dyad having its specific characteristics. Complementors and suppliers also build relations with the customer. The combination of all relations in figure 1 is called a *network* whereas the portfolio of dyads (interactions) that a firm is directly engaged in is labeled its *value net* by Ritter et al. [2004:176]. Ritter et al. argue that 'the ability to effectively manage such interactions (*with other firms*) is critical for achieving economic goals and as such a core competency of a firm and its personnel' [Ritter et al., 2004:178]. For the present purposes, however, we find that in order to gain an understanding of how knowledge about a customer's value creation process in the value chain is obtained it is not sufficient consider the focal company's own portfolio of relations but that we, in fact, have to consider the whole network. Accordingly, in figure 1, upstream

and downstream elements from the value chain have been added to Ritter et al.'s model to clarify that it is not only the focal company's relation to its immediate customers that is important, but rather the relation between the specialized supplier's network and the value chain of the customer.

In the following the framework presented in figure 1 acts as frame of reference in the understanding of how the focal company's network interplays with the value creation process of their customers. In this paper, focal companies are specialized suppliers in the automation industry and we focus on their customers in the aluminum industry.

Transfer of knowledge about the customer's value creation

Part of the specialized supplier's capability is, of course, rooted in production skills enabling fulfillment of customer's technical demands. However, many firms are able to deliver products that live up to specified technical standards, and therefore, this capability cannot constitute a core competence. Hence, the successful specialized supplier has to possess additional capabilities. These may very well be linked to be an ability to understand the role that production equipment plays in the customer's value creation process.

Pavitt [1984] discussing the relationship between specialized suppliers and scale intensive firms emphasizes that scale intensive firms provide operating experience, testing facilities, design, and development resources for the specialized supplier. In return, specialized suppliers provide scale intensive firm with specialized knowledge and experience that has been gained through development and production of process equipment, often in other contexts. This classical division of labor forms a basis for the 'mutual benefit' that is pointed to by Anderson and Narus [1991:96]. However, as pointed to in the above, if specialized suppliers are to gain a competitive advantage vis à vis their competitors, this mutual benefit has to consist of more than a mere division of labor. The specialized supplier also has to possess a competence that is not easily copied by competitors. Such a competence could consist of an ability to transfer special-

ized knowledge about the customer's and the value creation process of the customer's customer into his or her own value network. Differences in the handling of this knowledge transfer problem may be explained drawing on a framework developed by Madsen [2001]. This framework is displayed in figure 2.

Figure 2. Role of supplier categorized by type of knowledge transferred and level of collaboration

Intensity in transfer of knowledge	Level of collaboration	
	Intense	Modest
High (transfer of implicit and explicit knowledge)	1. Problem solver Moderate problems in transfer of knowledge	2. Technology specialist Substantial problems in transfer of knowledge
Low (transfer of explicit knowledge)	3. Collaboration specialist Few problems in transfer of knowledge	4. Commodity supplier Few problems in transfer of knowledge

Source: Madsen [2001:15] inspired by Hansen [1999:89].

A specific project that a SME undertakes can, according to Madsen [2001] be categorized into one of four categories depending on level of collaboration with the customer and the type of knowledge that needs to be transferred between the two parties. Projects in categories 1 and 3 are characterized by the firm having a close and trustful relation to the customer. Such a relation is developed over a long period of time and the partners share many experiences. If the kind of knowledge that has to be transferred is well-defined and thus explicit, there will be few problems in transferring this knowledge and, accordingly, it is difficult to gain competitive advantage in this situation. In these cases, the firm acts as a 'collaboration specialist'. If, on the other hand, the kind of knowledge that is to be transferred is complicated and/or implicit, there can be moderate problems in transfer of knowledge. In these cases, the firm acts as a problem-solver involving it self actively in understanding the needs of the customer, and the

competitive advantage of the special supplier is rooted in its ability to do so based on the intense relationship with the customer.

Projects are placed in categories 2 and 4 when the level of collaboration is modest. When the goal of the current project is solving a well-defined, stand-alone technical problem, the specialized supplier, in fact, does not act as such but as a ‘commodity supplier’. As we have put forward in the above, there is only limited possibility for creation of a competitive advantage over customers through this kind of project. If, however, the project is not well defined, the firm acts as a specialized supplier because there is a need to transfer both implicit and explicit knowledge. Our interest in the present research project is clearly cases in which SMEs are able to develop and sustain a competitive advantage through support of the customer’s value creation process and the study of how these firms handle, among other things, transfer of knowledge, and thus projects that require transfer of both implicit and explicit knowledge. According to Madsen’s (2001) framework, this can take place either based on intense collaboration between seller and customer, and thus, specialized knowledge about the customer (category 1, problem-solver) or based on the specialized supplier’s specialized knowledge in the field from other, similar projects (category 2, technology specialist).

To achieve a better understanding of how this, we have to look further into how small, specialized suppliers enact their own value net in order to facilitate transfer of implicit and explicit knowledge concerning how to create “value” for their customer and how this interacts with the division of labor previously described.

Methodology

As stated in the introduction, specialized suppliers and their relations to other firms is a topic that has been studied only very little in previous research. The approach in our study is accordingly inductive and explorative.

The cases for the study were selected from a database built in the autumn of 2004 containing relevant actors connected to the Danish aluminum industry. The database consists of 200 companies at the moment and of these, 24 are specialized suppliers to the aluminum industry. Suppliers of process production equipment that were selected for this study were chosen based on additional observations on the companies' own websites, and on interviews with key informants judged to possess knowledge about the aluminum industry to ensure that they would be relevant for the issue at hand.

Three companies volunteered to participate in personal interviews carried out by the two authors of this paper. All firms are selling process equipment to the aluminum industry in Denmark and mainly to the Danish market. In the following, we shall refer to the cases as firms A, B, and C to ensure anonymity of the firms. Firm A is a small owner-directed firm situated close to its main, large customer. A key reason for choosing firm A as a case for this study was that the company is a specialized supplier for a much larger company with whom firm A has worked for a long period of time (more than 30 years according to the informant). Firm A thus represents a firm that has intense collaboration with the customer. Firm B is financed by a large outside investor. Firm B differs from firm A in the sense that it is larger, financed by external parties, and therefore, the firm may be more modern in a managerial sense. Firm C is owned by the managing directors and their families. Firm C is interesting in the current context because the company is a larger firm acting as a complementor for firm A and, at the same time, in other industries, is a specialized supplier.

Drawing on Madsen's [2001] typology which was presented in figure 2, firm A could primarily be classified as a 'Problem Solver' due to collaboration with the

same, large customers over a very long period of time. Firms B and C could be classified both as ‘Problem Solver’ (category 1) and ‘Technology Specialist’ (category 2) depending on the project at hand. Firm B had long experience in producing for a specific industry but would serve several customers while firm C had a long standing, close relationship with a few, larger customers and the same time served many other customers. The firms thus all had projects that are relevant for the topic of this paper.

In all three cases, interviews were made with the managing director who would also be involved in managing relations to customers and the value network was interviewed. The study was explorative and, consequently, interviews were conducted in an open, rather unstructured manner. However, to be able to compare across the interviews and to ensure that what was regarded as important topics based on the preliminary literature study was covered, a loose interview agenda was prepared prior to conducting the interviews. The agenda for the first interview was based on the frameworks presented in figures 1 and 2. The agenda was updated between interviews. The interview would start by ensuring that the discussion was regarding projects involving transfer of both implicit and explicit knowledge. After this there would be questions aimed at getting a picture of the typical handling of relations in the value net in these projects. Special focus would be on if and how the informant would acquire and use information about the customer’s value creation process.

The interviews lasted from 60 to 90 minutes. They were tape recorded and subsequently they were listened through several times. Based on this, answers to the questions in the interview guide were written down. The resulting interview reports were sent to informants for approval. The findings reported in the following are based on interview reports, relations of these to the theories presented previously, and on discussions among the authors concerning the outcome of the interviews.

Findings

There were findings concerning the formation of the specialized supplier's value network as well as their perceived role in the value creation process taking place at their customer. The findings centered round the following topics:

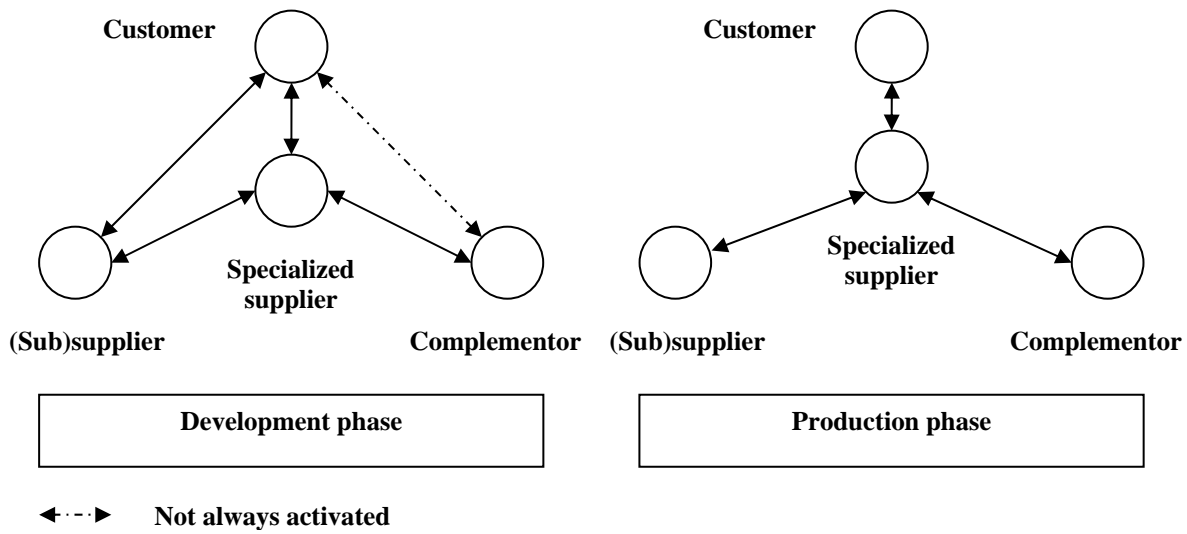
1. The constellation of the network changes as the project progresses
2. How knowledge transfer is handled
3. Relations and roles of suppliers
4. Relations and roles of complementors

In the following we shall elaborate on these findings.

Different constellations as the project progresses

An important finding was that the composition, as well as the allocation of tasks between the firms that form part of the process innovation, changes, as the project advances.

Figure 3. Relations in the specialized supplier's network



In projects targeted at developing complex production equipment, transfer of implicit and explicit knowledge is necessary. In such projects, relations in the network are as illustrated in figure 3. All partners are involved in the planning stage of a project. According to the informants, this enhances the quality of the final project because the inclusion of all partners ensures that the amount of knowledge that has to pass more than one entity is minimized and therefore, the probability of a joint understanding of the demands and specifications of the process equipment is maximized. In this stage, the value net constitutes a fundamental part of the value creation process.

Figure 3 also illustrates how the construction of the value network changes as the project continues into the production phase (after signing the contract). Communication in this phase and the finalization phase mainly is restricted to take place between the specialized supplier, who is responsible that the production equipment is delivered as specified, and the customer. In this phase, the specialized supplier acts as 'network hub'. A 'network hub' is defined as a firm that 'is in control of a network of others firms...and is concerned with the management of the network' [Ritter et al. 2004:177]. Finally, figure 3 illustrates that the specialized supplier acts as a link between (sub)supplier and complementor.

Comparing to figure 1, we have, therefore removed the arrow indicating a relation between these two parties. In the cases studied, it is logical that there is no connection between sub(suppliers) and complementors. Complementors supplement the focal company in high tech areas where the specialized supplier feels too small to build competences that could efficiently be capitalized on while (sub)suppliers tend to be traditional manufacturing companies.

Translating value into specifications

As we pointed to earlier in this text, it may be problematic for the specialized supplier to derive the technical demands from the needs of the customer and an important competence. We expected that it would be considered difficult to embrace the next link in the value chain: the customer's customer. However, during the interviews, it became clear that this was not experienced as a problem by the specialized suppliers. Three main explanation were given for this by the informants:

The first explanation was given in relation to the projects in which the firms acted as problem-solvers according to the typology presented in figure 2. Such projects are characterized by the specialized supplier and the customer having long-term relations. Therefore, the specialized supplier has detailed knowledge about the customer's production processes and the value creating process at the customer's customer. The long relationship also seemed to have entailed adaptation in both human and physical assets. Such adaptation has been shown to augment product quality [Dyer, 1996] and to increase supplier dependence, trust, and commitment and hereby lowers the decision making uncertainty for the buyer [Gao et al., 2005:401].

The second explanation for small problems in translating value into product specifications was mainly given by the informants in firms B and C in relation to projects in which these firms act as technology specialists. In these projects, the firms, due to specialist knowledge regarding production processes in the industry, were able to draw on this knowledge in new projects. The knowledge would be applied on two different levels depending on the level of cooperation

that the customer was ready to engage in. If the customer was mainly interested in purchasing a product, little knowledge would be transferred to the customer. If the customer would be interested in investing time (and money) in getting an integrated production solution, knowledge would be transferred from the specialized supplier into this solution.

The third and final explanation for few perceived problems in the transfer of knowledge about the value creation process given by the informants was that the people dealing with each other would all be technicians. A consequence of the communication taking place at the technical level is that the communication takes place between technicians on both sides of the figure. This means that they are able to communicate in the same language. The translation from value to technical specifications was done mainly by the customer in the case where the customer was much larger than the supplier (firm A), whereas translation seemed to be more joint when specialized supplier and customer were more equal in size (firms B and C). It seems that the technicians in the two companies act as ‘bridges’ [Granovetter, 1973] even though they, as far as we could see, have strong ties to their own organizations.

(Sub)suppliers – an outsourcing facility

The informants all emphasized that customers demand ‘solutions’ rather than mere ‘products’. This is in line with the observation of Håkansson and Waluszewski [2005:112] that in today’s world ‘exchange deals with the dynamic creation of new solutions’. As a consequence of this demand for production process solutions, the small, specialized suppliers in our study all have formed partnerships with suppliers that are able to *supplement* the production skills that the specialized supplier possess in a way that the partners together are able to form an entity that is able to deliver a complete solution rather than a compilation of products. Along this line, Ritter et al [2004:177] point to that ‘the functioning of these networks depends on the capabilities of the actors as well on the working relationships between them’. We saw that ‘working relationships’ differ depending on the complexity and the development phase of the project as discussed in connection to the typology presented in figure 2. In addition to

this, the working relationships are dynamic as they depend on the project at hand. The specialized supplier in the preplanning phase estimates which of a few suppliers will best be able to supplement his skills in a given project and the partners in the value net are thus differs from project to project. This way, the few (sub)suppliers that are part of the specialized supplier's network act as a permanent flexible outsourcing of production capability. This construction enables the specialized supplier to focus on the parts of the production process that is his main competence while at the same time being able to deliver a turn key project. To which level suppliers are involved in project development depends, according to the informants, on the complexity of the project. In total, the arrangement found is much more flexible and allows more specialization also in the supplier firms than if one single firm should build all competences needed.

Complementors – turning a threat into a possibility

Complementors play a significant role in the value creation process taking place at the specialized supplier. Complementors seem to often be much larger companies than the specialized supplier they complement. The role of the complementor is, to a great extent, to complement the specialized supplier in projects that the specialized supplier feels too small to handle alone or in projects, where the complementor due to a specialization in a few, narrow areas of activities is able to handle specific, complicated parts of the project. One of the informants stated that the complementor in some senses is a competitor, but that he had chosen to collaborate with the complementor. This way this much more resourceful company had been turned into an ally rather than an enemy because each company could concentrate on the parts of the project that was related to their own capabilities. In some projects, firm C acted as a complementor in relation to firm A. In these situations firm C shared the perception of the relation between firm C and firm A. The informant in firm C stressed that their interest in engaging in this strategic alliance was that forming such alliances enables them to serve a much larger part of the market spending fewer resources. They could do this because the alliance made them able to concentrate on the part of projects that they are specialized in handling. A strategic consequence of this

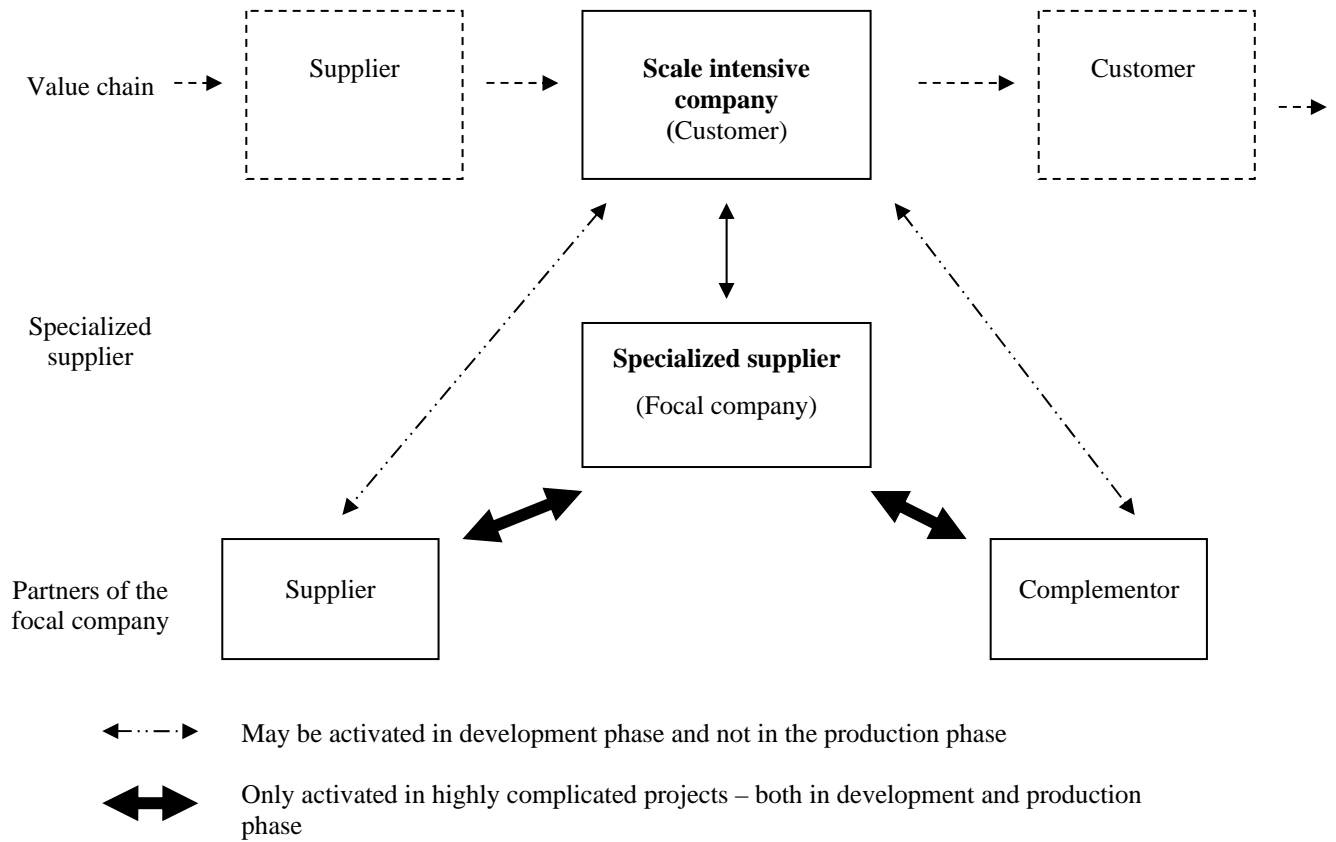
behavior is that the specialized supplier is able to occupy a position as negotiator representing the network vis-à-vis the buying company.

The specialized supplier's value network

Keith Pavitt sees the completion of process innovations as a result of a static, dyadic interplay between the two parties (buyer – seller relation). Focusing on how small, specialized suppliers innovate in cooperation with buyers of process equipment it seems that Pavitt's classification does not contain sufficient details to capture all aspects of the process. On the basis of the cases studied it is our opinion that the influence from several additional factors imply that the rather static, dyadic view needs significant changes.

The specialized suppliers that were studied are small firms that are closely related to their customers. When large, complex process developments or changes are needed, the competences possessed by the relatively small specialized suppliers are not sufficient. Therefore, firms possessing relevant complementary competences (complementors) act as strategic partners for the specialized supplier. To the passive specialized supplier, the cooperation with complementors is probably seen as an inevitable loss of an order. However, to proactive specialized suppliers, recognition of own limitations can be transformed into an advantage. This is because their insight into and understanding of the fundamental business conditions (in relation to the value creation process) of the customer entails that the specialized supplier is able to play an active role in co-development and co-production with the complementor firm as well as bridging between customer, suppliers, and complementors. This finding is in line with Ritter et Al. [2004:177] emphasizing that 'suppliers of complementary products and services may also be innovation partners, as new products can arise from recombining their outputs in productive ways'. This is illustrated in figure 4 which is developed from figure 1 according to the findings in this study.

Figure 4. The specialized supplier in relation to the value chain and partners



Inspired by Ritter et al. [2004] and interviews– the boxes and arrows with dotted lines are additions to the original model.

Figure 4 differs from figure 1 in several respects. Firstly, there is no relation between supplier and complementor. In the study we found that these firms are not in direct contact with each other. Suppliers are often local companies that are specialized in production according to specifications given by the specialized supplier whereas complementors are at least domestic oriented and highly specialized in their field. Secondly, the relations in the value network are not static. To highlight this, relations are shown in different graphical forms. The relation between customer and supplier is always-present during the project. This is indicated by a straight line. The dotted lines indicate relations that may be activated only in the planning stage of the project, whereas the bold lines indicate relations that are only present in complex projects – that is when the spe-

cialized supplier acts as problem solver or technology specialist depending on the strength of the relation to the customer.

Discussion and implications of the findings

Embarking on the explorative research project that is described in this paper, our intention was to understand how specialized suppliers go about grasping what ‘value’ is to their customers and how they turn this knowledge into competences that they can use in the market in general and in the future. Quite early on in the research process, we discovered that an important competence for the specialized supplier is the ability to be situated at the middle of the value network coordinating communication and resources between the other parties in the network. Therefore, our focus turned towards understanding the relations in this network and how specialized suppliers build their value net in a way that supports the customer’s value creation process. Along this line, we found that specialized suppliers’ value nets differ in development and production phases of process equipment. The fundamental way of working together, performing work processes, evaluating work result etc. before and after signing the contract are very different.

The three specialized suppliers that were studied differed in level of collaboration with their customers. One firm could be classified as a problem solver in all the projects that were discussed in relation to this study. The other two firms could in some projects be characterized as technology specialists and in other projects as problem solvers. Drawing on this classification, we would expect the value networks of the focal companies to differ because transfer of knowledge is much harder for the technology specialist than for the problem solver due to the smaller knowledge about the customer. However, although differences were found, similarities seem to overshadow these differences.

In all three cases studied, we found that the specialized suppliers were very much aware that knowledge about the value creation process taking place at the customer firm was important, and in all firms, there were also examples of de-

tailed knowledge about the demands of the customer's customer. In all cases, the transfer of knowledge was facilitated by the fact that communication would take place mainly between the customer's Production Engineering (PE) department and technicians employed as selling staff by the specialized supplier. As put forward earlier, specialized suppliers are mainly selling products that are of strategic importance to their customer. Therefore, it could be expected that the planning stage would involve a buying centre consisting of people from several departments including top management [Nielsen, 1991]. Our interviews however revealed a different picture. It turned out that in most cases the buying centre would consist of mainly production engineers and only in a few cases involve top management. This is, according to Nielsen [1991: 29] more the picture that is typically seen for purchase decisions that are functional and not strategic. An explanation for our finding could be that the translation from value to specifications is made by production engineers inside the customer firm taking part in a buying centre placed there and that these engineers, in fact, deal with a buying diverse buying centre inside their own organization.

Transfer of knowledge was also facilitated through the specialized supplier's acting as information coordinator/broker among the parties in the value network. The content of this role as broker is different in the development and production phases. In the development stage, all members of the value network attend meetings to minimize communication problems adhering to communication through several links. After the contract has been made, the specialized supplier acts as an information bridge between the parties involved and also carries the economic responsibility. This seems to be more often so if the specialized supplier is a problem solver. This is because the technology specialist, to a greater extent, would use the same communication structure throughout the entire project because of the larger problems in transfer of knowledge. However, also the technology specialist would take on economic responsibility for the entire network once the contract was written.

Another finding was that the specialized suppliers were very aware that they are not able to do everything themselves and that collaboration with other firms is,

therefore, of special importance to them. This awareness materialized itself in specialized suppliers having a portfolio of other small or medium sized firms that they would draw on as suppliers depending on the task at hand. These firms were clearly not considered possible competitors. In addition to these (sub)suppliers, the specialized suppliers in the study were aware that some orders would be too large and too specialized for them to handle on their own. For these orders, the specialized supplier would have a portfolio of strategic alliances with complementors. The power relations with these firms would be different than that with suppliers as these firms would be possible competitors as they would be able to handle the order themselves. However, the specialized suppliers would disarm these larger, specialized firms by entering into strategic alliances with them and also by letting them handle just the part in which they are specialized while taking over economic responsibility for the project as a whole.

In total, our findings implicate that for specialized supplier to stay in groups 1 and 2 and act as problem solvers or technology specialist rather than collaboration specialists or commodity suppliers they have to build a core competence aimed at delivering complex process equipment through participation in and management of value nets involving subsuppliers and complementors. A necessary prerequisite for this is that the specialized supplier realizes the necessity of doing this and allocates resources to this rather than to building all resources inside his own company.

Future research

Important limitations in this study are the very limited number of interviews that were carried out and the fact that we only interviewed specialized suppliers and not their customers. The specialized suppliers are only able to state how they try to understand what important values are to the customer and how they enable themselves to deliver this value. To check whether they actually do what they think they do and to check whether the effort made is perceived as assumed by customers, a follow-up study could be carried out among customers

of the investigated specialized suppliers. Along the same line, additional interviews with specialized suppliers could be carried out to strengthen the basis for the findings presented in this explorative study. Of special interest seems to be to enhance the understanding of the different roles that different specialized suppliers play in the various projects in which they engage. Finally, we would like to gain more insight into the interplay among the actors in the value network by interviewing (additional) complementors and (sub)suppliers.

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