

## Network pictures and network potentials in supply management

### Abstract

This paper focuses on the use of network pictures for managing supplier relationships in their network contexts. In particular, the paper addresses the following three issues: (1) How can we conceptualise the congruence between a customer company's picture of its supplier-related network and the supplier's picture of its network? (2) What benefits may ensue from changing the customer company's supplier-related network picture? And (3) How may a customer company proceed to find hitherto unknown potentials in its supplier-related network? Based on a single case study of a company and four of its main suppliers, we compare and contrast the supplier-related network pictures of the customer company with the network picture of the suppliers. Furthermore, we identify network potentials which a customer firm may identify following a change of its network picture. Our investigation and analyses enables us to make the following suggestions. Firstly, a company may consider if parts of its network pictures are incomplete, incorrect, obsolete or generalised, and if such incongruities matter for the manner in which it manages its suppliers and the network pictures are in need of revision. Secondly, if the company revises its supplier-related network pictures, it may find valuable, hitherto unknown supplier-related network potentials which may form the point of departure for changing certain parts of the relationships to the suppliers. Thirdly, in order to revise its supplier-related network pictures and gain additional insight into its supplier-related networks, a company may employ different strategies: systematic search, systematic discovery, chance search, and chance discovery.

### Keywords

Network pictures, network horizon, supply network management, network potential, search and discovery

### Authors

Elsebeth Holmen (corresponding author)  
Norwegian university of science and technology  
Department of industrial economics and technology management  
N-7491 Trondheim  
NORWAY  
holmen@iot.ntnu.no

Tina B. Aune  
Trondheim Business School, HiST  
N-7004 Trondheim  
NORWAY  
tina.aune@hist.no

Ann-Charlott Pedersen  
Norwegian university of science and technology  
Department of industrial economics and technology management  
N-7491 Trondheim  
NORWAY  
pedersen@iot.ntnu.no

## Introduction

This paper connects two of the concepts which have received increased attention in research on industrial networks: *Network pictures* and *supplier networks*. Firstly, it has been suggested that *network pictures* are important guides when managers consider the relevance of various actions and reactions they may undertake in their surrounding business networks. Secondly, it has been argued that the importance of purchasing and supplier relationship management is growing, and that companies should not manage their supplier relationships in isolation but also consider the *supplier networks* in which these supplier relationships are embedded. Based on a study of a company's four main suppliers and their respective network contexts, we address the characteristics of network pictures which companies use for managing in supplier relationships and networks. Furthermore, we discuss how and why companies may consider changing their network pictures in order to improve the way in which they manage in their supplier relationships and networks.

## Theoretical basis

Relationships between companies in a network context have been studied extensively within the Industrial Marketing and Purchasing Approach (IMP) (e.g. Håkansson and Snehota, 1989; Håkansson and Snehota, 1995). It has been found that many of a company's relationships are interconnected, and that it therefore is useful to study how they affect each other positively and/or negatively (Anderson et al., 1994). For example, due to connections between relationships, a company may access resources in and improve its performance through indirect relationships, such as the suppliers' and customers' other relationships. According to Ritter (2000) the interconnectedness between relationships in a network is sometimes overestimated, but more frequently managers underestimate interconnectedness and try to manage single relationships in isolation. In this paper we consider companies and their relationships to be part of business networks where exchange in one relationship influences other relationships.

A continuous discussion both among managers and among researchers is how much a company needs to know about the network context of which it forms a part. According to the IMP approach, the challenge therefore becomes how to manage in an interconnected network which, furthermore, is constantly changing. Furthermore, companies need to decide how much effort they should spend on getting insight into how companies around them are operating and how the company's own operations fits into the developments in its network context. According to Håkansson and Johanson (1993) companies have limited knowledge about the networks in which they are engaged. This view is in line with the 'cognitive' school of strategic management which suggests that there are limits to the amount of resources available to companies, including the amount of cognitive capacity of its employees. It is, therefore, argued that individual actors do not have the capacity to know all network possibilities, or remembering all previous solutions or spending time and resources to perform complex but necessary assessments with regard to all available options (March and Simon, 1958; Simon, 1976). Recently there has been an upsurge in research on the concept of network pictures (Ford and Redwood, 2005; Henneberg et al., 2006; Mouzas and Naude, 2007; Öberg et al., 2007; Mouzas et al., 2008). Network pictures refer to "*the views of the network held by participants in that network*" (Ford et al., 2003, p.176). Such pictures reveal the company's or the individual's perception of what is happening around them, and guide in assessing usefulness of various actions and reactions they may undertake. In the IMP approach, the notion of network pictures is closely related to the concepts of network horizon, network context, and network environment. "*Network horizon*" (Håkansson and Snehota, 1989; Anderson et al., 1994; Holmen and Pedersen, 2003) refers to the part of the network a single firm is aware of, i.e. how extended an actor's view of the network is. The part of the network horizon which the firm considers relevant, is the firm's "*network context*" (Holmen and Pedersen, 2003). Further, the part of the overall network, which a single firm is not aware of, is its "*network environment*". Network pictures provide a context, and are framing and sense-making devices as well as possible triggers for managerial activities. Network pictures, therefore, act as a reference point for the way in which actors interact with each other. They affect the actors' networking, i.e. provides an understanding by the actors of "...*what they can or might wish to do*" (Ford et al., 2002, p.7). The networking of each actor and their reactions to that of others will depend on their unique network pictures (Ford and Redwood, 2005). The network pictures thereby function as general framing constructs that allow organizations to cope with contextual circumstances and to pursue desired outcomes (Mouzas and Naude, 2007). It is likely that several different network pictures are held in one company, depending on functional expertise or

experiences of *individuals* in the company. In addition, a customer's network picture may be very different from a supplier's network picture. This is because a network picture is based on the perceptions an actor has of how other actors around them are connected. Different companies and the individuals within them will therefore *"each have a different picture of the extent, content and characteristics of the network, of who is doing what and what does and does not work"* (Ford et al., 2003, p.176). Holmen and Pedersen (2003) suggest that all firms can benefit from analysing and trying to change its network horizon. The choice of network horizon is a major decision for management in the drawing of their network pictures (Ford et al., 2003). Furthermore, firms should also try to understand how the network functions from the perspective of its counterparts – how the counterparts frame and read their network context, i.e. see by using a number of different "glasses" (Holmen and Pedersen, 2003). This is in line with Ford and Redwood's (2005) suggestion that managers should examine their own network pictures and those of the companies around them *and the assumptions on which they are based*. These may form a way of improving their understanding of the dynamics of the network and to reduce the danger of missing significant changes. In a similar vein, Mouzas et al. (2008) argue that *"... an incomplete knowledge of the context (by managers) may lead to inappropriate action"*. Therefore, companies should supplement their network pictures with interaction, in order to amalgamate and "objectify" individual network pictures so that they give rise to "network insight" (ibid). However, to have full insight into their own network pictures as well as those of companies around them is a very challenging task for companies, if not impossible. It can therefore be argued that there is a significant difference between what is factually possible in a network and what is conceivable by an organisation or individual using their individual network pictures (Mouzas et al., 2008).

Since the 1980ies supplier relationships and networks have gained increasing attention (Gadde and Håkansson, 1993; Lamming, 1993). By outsourcing activities to their suppliers, companies have been able to improve their efficiency by providing economies of scale and scope in their operations. Furthermore, suppliers also increasingly contribute to the technical development of a company and are sources of important knowledge and skills (Håkansson and Eriksson, 1993; Dyer et al., 1998; Wynstra et al., 2001, Lakemond et al., 2006). The relationship to a supplier will be influenced by a number of different aspects. At the dyadic level, the following issues have received much attention: if the company is an important customer in terms of volume, technical development, competence development, reference, and position. At the network level, related issues have received attention: if the other counterparts of the supplier are complementary to the company in terms of activity complementarity, resource transferability, or actor-relation generalizability (Anderson et al., 1994). The challenges a supplier faces in creating positive connections across its customer relationships have also been discussed by MacDuffie and Helper (1997), Nobeoka et al. (2003), and Mota and de Castro (2005). Since suppliers are constantly being influenced by their mix of important counterparts, it seems important for a customer to have insight into and take account of the supplier's network context when the customer tries to manage (in) the supplier relationship.

As mentioned earlier, the actions of companies as well as their reactions to that of others will depend on their network pictures (Ford and Redwood, 2005). Therefore it is interesting to use the concept of network pictures when investigating important supplier-customer relationships and the network context in which they are embedded. For example, it may be important for a company to have insight into which relationships that are connected to its suppliers. This type of insight may enable a company to make strategic decisions based on knowledge of where the company itself is positioned in a supplier's network picture and how a supplier prioritises its resources. Furthermore, insight into the suppliers' network pictures will enable the firm to see where certain capabilities and resources reside in the business network. By having insight into the suppliers' existing concerns a company may find it easier to make strategic decisions which will increase the performance of both the customer and the suppliers. This paper focuses on the use of network pictures for managing supplier relationship in their network contexts. In particular, the paper addresses the following three issues: (1) How can we conceptualise the congruence between a customer company's picture of its supplier-related network and the supplier's picture of its network? (2) What benefits may ensue from changing the customer company's supplier-related network picture? (3) How may a customer company proceed to find hitherto unknown potentials in its supplier-related network?

## Empirical basis and methodology

The paper is based on an exploratory single case study, with four embedded units of analysis. The focal customer firm A is a medium-sized manufacturer of equipment for applications on land, at sea and in petrochemical, oil and gas industry. The firm has approximately 320 employees and is part of a diversified global corporation whose products among other things include air conditioning, aerospace systems, helicopters and other systems. Customer firm A offers a comprehensive range of products, including smoke detectors and fire alarm control panels for maritime, offshore and industrial purposes. A's main capability is the production of complete systems and total solutions, ensuring the optimal utilisation of and interaction between detectors, interfaces and fire alarm control panels. Over the last twenty years the firm has outsourced many of its activities and is therefore increasingly dependent on having suppliers with manufacturing capabilities as well as the ability to meet certain cost, quality and delivery goals. Customer firm A develops and assembles most its products in-house, mainly because of strict directions regarding certifications and approvals in the fire detection industry. Customer firm A has 300-400 active suppliers, categorised as A, B, C, and D suppliers. The study focuses on customer firm A's relationships to its four main suppliers. These suppliers are categorised as A-suppliers, i.e. they are the most important ones both in terms of purchasing spend and in terms of criticality for the end product. It is the respective networks related to these four suppliers which comprise the four embedded units of analysis in the case study.

The empirical basis was build up through several rounds of inquiry. *Firstly*, the authors had carried out previous studies of the focal company and one of its main suppliers. These studies were carried out approximately 6-10 years before the main rounds of inquiry for the paper were carried out, but it meant that the authors were familiar with some of the informants as well as the products and supply related issues.

*Secondly*, the empirical basis for addressing the first issue in the paper was gathered during fourteen semi-structured, face-to-face interviews with the focal firm and the four suppliers. Seven interviews in the focal firm were carried out with the purchasing manager, the senior purchaser, and the product development manager. The seven interviews with suppliers were carried out with employees in positions such as production manager, production coordinator, engineering workshop manager, technical consultant, marketing manager, logistics manager, and managing director. The interviews were conducted over a period of one year. In addition, tours of production units, brochures, and annual reports have added to the case study. A workshop at the focal firm was also held at which the preliminary results of the study were discussed. In the interviews with the focal firm, the main topics were: who are the main suppliers, how the relationships to these suppliers have developed over time, and who the other important counterparts of the suppliers are. In the interviews with the suppliers, the main topics were: how the relationship to the focal firm has developed, who the other important counterparts (especially other customers) of the supplier are, and what characterises the relationships with regard to efficiency and innovation.

*Thirdly*, the empirical basis for addressing the second issue consists mainly of interviews with the former Purchasing Manager of the focal company, who is now the Purchasing Manager of one of the main suppliers of the focal company. Our main idea was to find out if unknown elements in the supplier-related network matter to the focal company. That is, having established the existence of unknown elements in the focal company's supplier-related network horizon/picture, we wanted to inquire into which effects insight into these unknown elements would have had on the way in which the focal company handles the relationships to its main suppliers. Neither the focal company, nor its suppliers, had any ongoing program aimed at increasing the insight into its supplier network. Furthermore, some of the interviews with informants from different companies contained elements which were confidential, i.e. some suppliers made us aware of customers or issues which we were not to disclose to the focal company. We might have been able to get permission to disclose some of the unknown elements or facilitate discussion among the companies on them. However, we had no intention of carrying out action research and therefore an interventive route of inquiry did not seem useful for us. However, serendipity played a role, as we came aware that the former Purchasing Manager of the focal company had switched jobs. This meant that it was likely that the Purchasing Manager had gained insight into elements of the focal company's supplier-related network of which he was unaware when he was based at the focal company. Having analysed the empirical material mentioned above, and having identified the existence of incongruent elements, we asked the Purchasing Manager a) if he, after his career shift, had become aware of counterparts,

resources, capabilities etc. of the focal company's main suppliers which he was not aware of earlier on, and b) if awareness of these aspects would have affected the way in which the focal company managed the relationships to its main suppliers. In summary, we asked the Purchasing Manager to carry out a thought experiment with us.

*Fourthly*, we also asked the Purchasing Manager for comments on the four different strategies for gaining insight into supplier network potentials (i.e. the third issue). We explained the two main dimensions of the developed matrix to him and described the four different strategies in the matrix. He was then encouraged to comment on each of the four strategies as well as the overall matrix, and their potential usefulness. *Overall*, the paper is based on quite extensive empirical material. Some of the material is old and was collected for other purposes. Some of the material is recent and was collected specifically for the purpose of the present paper. Furthermore, some of the material was based on traditional "information gathering" and some was based on "thought experiments" and "feedback" on our analyses and suggestions. Having carried out several rounds of iterations between praxis and theory, we have sought to systematically combine the empirical and the analytical realms, including informant checks on the outcomes of our combining efforts.

### **Network pictures, network potentials, and strategies for finding network potentials**

Our exploratory study suggests a number of issues that influences how a company may manage its supplier-related networks based on network pictures. Firstly, how incongruence between the respective network pictures of the customer and the supplier can be conceptualised. Secondly, which possibly valuable network potentials a customer may find if it changes its supplier network pictures. Thirdly, how a customer may proceed to find network potentials beyond its present supplier network pictures. In the following sections we examine each of these issues.

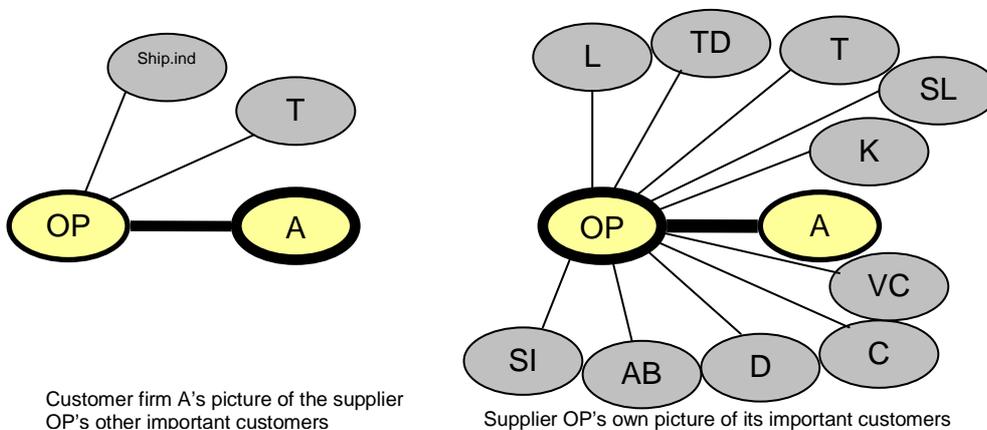
#### ***How can we conceptualise the congruence between network pictures of two firms?***

As we discussed earlier, network pictures form the basis for how managers try to manage in networks. Furthermore, it is suggested that it may be beneficial for a company to consider the network pictures of its counterparts in order to improve the company's understanding of the network and to reduce the danger of missing significant changes in it (Ford and Redwood, 2005) or possibilities which so far have been overlooked. With this as the point of departure, we analysed the relationships between case company A and its four main suppliers, with particular attention paid to differences between the network pictures of the respective parties. In total, we have been able to draw four pairs of network pictures, which are presented below *per* supplier.

*Network pictures related to supplier OP.* OP manufactures products and applications in plastics and has approximately 40 employees. OP has been a supplier of customer firm A for eight years, producing the plastic cover for the smoke detectors. An injection moulding machine produces the plastic covers for A 24 hours a day during the week. Apart from occasional discussions regarding the shape and colour of the smoke detectors, there is not much cooperation between supplier OP and customer firm A on product development. Customer firm A develops the plastic cover for the smoke detectors in-house and sends the 3D-model to supplier OP for production. When developing prototypes, however, customer firm A usually involves OP as a discussion partner because of their expertise on injection moulding. The continuous development of the smoke detectors has not been very rapid in the later years and OP is still producing the same smoke detectors for customer firm A today as they first did in 1999. Due to customer firm A's requirement for dependable deliveries, OP holds consignment stock at customer firm A's site. This enables supplier OP to adjust its deliveries based on prognoses and available stock. Customer firm A assumes that they are among supplier OP's five largest customers. Customer firm A considers it important that OP also produces complex products for other large customers as this may have positive effects for OP's capability development. Customer firm A has, however, not very much insight into who these customers are and how they influence supplier OP's capability development. From customer firm A's perspective it is not crucial to have such insight as they believe that OP's other customers operate in industries which are very different from theirs. Customer firm A trusts OP to transfer knowledge that is being developed in other customer relationships if they find it suitable for the work they do for A. Customer firm A is very price-focused and has a continuous dialogue with OP on cost cutting. Another strategy in A's quest for cutting costs is to always search for alternative suppliers in low cost countries. The pressure to find the supplier with the lowest price has increased since A became part of a global corporation

based in the US. At the moment A has a portfolio of 8-10 plastic suppliers that are used and evaluated by customer firm A from time to time. Supplier OP has many customers in different industries. The customers are categorised as A+, A, B and C customers according to turnover from these customers. Customer firm A is OP's 4<sup>th</sup> or 5<sup>th</sup> largest customer representing 7-8% of OP's turnover. From OP's perspective a number of other customers stand out as particularly important due to their influence on turnover and capability development. One such customer is TD, a company focusing on data storage products. When developing and designing new products, customer TD cooperates closely with OP. TD has outsourced its production and made OP responsible for a number of products, for example the production of plastic frames for computer screens. TD focuses on supplier development and often connects several of its suppliers – including supplier OP – to work on the same projects. Customer TD is a very demanding customer and OP needs to spend much time working on its products. Due to the relationship with customer TD, OP has developed capabilities in developing complex products, cooperating with a group of suppliers for product development, and working closely with a large, demanding customer. The network pictures of customer firm A and the supplier OP are shown in figure 1.

Figure 1: Customer firm A and supplier OP

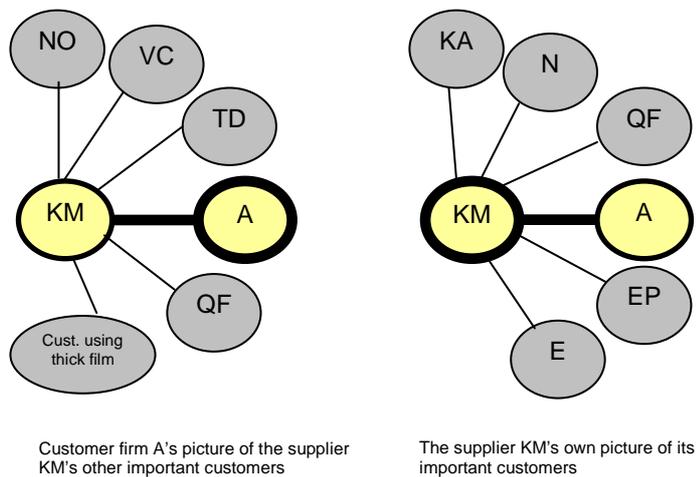


The network pictures are *incongruous* in the sense that the network picture of customer firm A is *incomplete* and *generalised*. Firstly, customer firm A's network picture is incomplete because its insight into OP's other customers is not very extensive. Several of the most important counterparts of OP are unknown to A. Customer firm A is aware only of one other specific customer of OP. Secondly, customer firm A is aware that OP has customers in the shipping industry, however it is *unable to specify which particular customers they have*, which implies that the network picture is *generalised*. The picture is, however, *congruent* with OP's own network picture in the sense that OP has a relationship with customer T as well as customers in the shipping industry. Even though customer firm A has some insight into which actors OP cooperates with, it has very little insight into the content of these relationships. Due to this lack of knowledge it may be difficult for A to utilise resources that are developed between OP and its other customers.

Network pictures related to supplier KM. In 1980, customer firm A outsourced its thick film department and established what is now supplier KM, one of Scandinavia's major microelectronics manufacturers. KM has approximately 60 employees and is part of a large industry group specialised in contract design and manufacturing of industrial electronics. KM is A's largest supplier in terms of purchasing spend and volume. For many years KM has manufactured small instrumentation modules based on thick film and PCB (Printed Circuit Boards), a critical component in the smoke detectors developed by A. The development of the thick film and PCB that is seated on the plastic mounting base in the smoke detectors is handled internally by A. KM would, however, like to be more heavily involved in the development of the circuit boards to make them more efficient to produce, as well as cooperate with A to modernise the smoke detector designs. The smoke detector designs have not changed since 1997, and A has decided to keep most development in-house. A predicts that the use of thick film will decline, however, so far this has not happened. According to customer firm A, they were KM's largest customer for many years and are still KM's

largest customer in the thick film market. Around ten years ago KM started to sell PCB's to other large customers besides customer firm A. Customer firm A knows that KM has a few large customers in that market, however they do not have a comprehensive overview of who these customers are. It is important for A that KM has other large customers as they believe KM will be very vulnerable if A were their only large customer. However, A does not think that knowledge development in KM's other customer relationships can be helpful for A in any way. According to A there is not much knowledge that can be transferred between customers of KM when it comes to production, since this knowledge is very industry specific. As mentioned earlier, price is an important factor for customer firm A when selecting suppliers. They emphasise that it is important that KM has a clearly defined purchasing plan for handling its own suppliers to get the lowest possible price of components. Customer firm A is well aware that KM can obtain better purchasing deals when they have a number of large customers. From a price perspective A therefore finds it beneficial that KM has other large customers in addition to themselves. According to KM, price seems to be a more important factor in the industry A represents compared to other industries, where more emphasis is put on quality and capabilities. KM ranks customer firm A as their 4<sup>th</sup> or 5<sup>th</sup> largest customer in terms of turnover. However, the slow innovation rates at A, as well as their closed innovation model, are negative factors when KM ranks its customers. KM acknowledges that the PCBs they supply to customer firm A are standard products which can be sourced from anywhere in the world, implying that KM can easily be replaced. However, finding suppliers that manufacture thick-film is more difficult and KM feels they have a strong position as a supplier of A for these products. A is still regarded as an important customer and the two companies know each other very well from their long-lasting relationship. From KM's perspective it would, however, be beneficial if they could produce a more complete system for A and/or be more involved in their product development. However, A views product development and assembly as their core competences and wish to keep them internally. The largest and most influential customer of KM is company QF, one of the world's leading total suppliers of intelligent transport systems and toll collection systems. This customer's tolling system involves the use of toll road tags for automatic payment of tolls and KM produces thick film hybrids and complete toll road tags for this system. KM was involved in developing the first generation of toll road tags in 1994 and has since then manufactured 1.5 million units. QF continuously involves KM in the technical development of the circuit boards to enable a more efficient automated production process. In cooperation with QF, KM has developed an automated production line which is specifically adjusted to the production of the toll road tag. KM produces the complete product for QF, including the assembly of different components in the plastic cover. Another large customer that cooperates closely with KM is KA, a company which develops, manufactures and markets systems for gearshift, clutch actuation and seat comfort. Lately, the use of electronics in automobiles has accelerated, and this trend seems to continue for some time to come. The automotive industry has very demanding quality requirements which make it very important to minimise production errors. KM must have an error rate of max. 25 parts-per-million (ppm), and KM has worked hard to fulfil KA's strict quality standards and eliminate defects. Therefore, customer KA involves KM from the specification stage when developing circuit boards that are part of the seat control units. As several components have to be adapted to each other, KM also has to cooperate with some of KA's other suppliers. By including KM at an early stage it is much easier to find a more optimal production process. From the early function descriptions provided by KA, KM developed a PCB which is now produced in approximately 180,000 units per year. KA and KM also spend much time finding the most appropriate layout of components on the PCB's to ensure efficient production. This is a continuous process and minor adjustments are made when necessary. Due to the potential of growing as a supplier in the automotive industry and the skills they are developing, KM currently allocates much time and resources to customer KA. For example, at this time, KA is involved in developing an automated production line in cooperation with KM. The development of this production line is to a large extent based on the process knowledge KM obtained from the close relationship with QF. The main reason why KM sees KA as an important customer in the future is the predictability in the automation industry when it comes to production. It is usually decided on a three-year basis how much needs to be produced, which makes prognoses easy to relate to. The network pictures of customer firm A and supplier KM are shown in figure 2.

*Figure 2: Customer firm A and supplier KM*

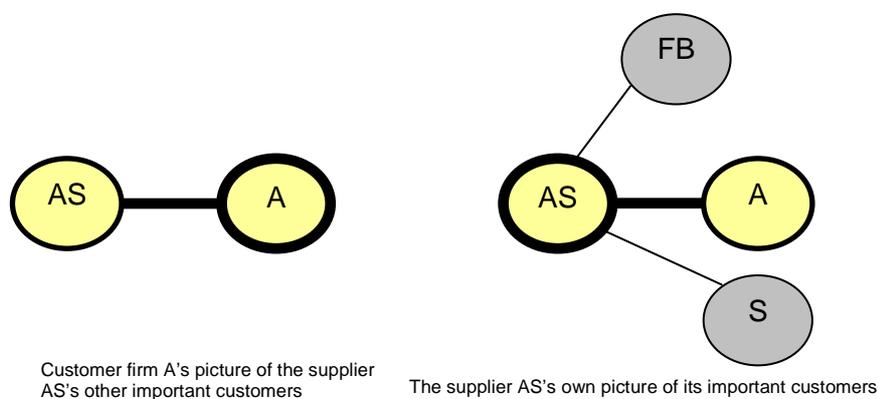


Firstly, parts of A's network picture are *obsolete*, in the sense that parts of the network picture are no longer correct although they were correct at an earlier point in time. One of the customers that A imagines to be important for KM (TD) is no longer an important customer of KM. Customer TD was an important customer of KM in the late 80ies. TD was very focused on quality and their high demands were important for the development of KM, especially TD's involvement in developing efficient production techniques. TD was a company in rapid growth and KM was not able to deliver as large quantities as TD demanded. TD therefore found another supplier that could supply the amounts needed. Secondly, parts of A's network picture are *incorrect*, since some of the counterparts which customer firm A identifies as important for KM (VC and NO) have, in fact, never been customers of KM. Thirdly, A's network picture is *incomplete*. KM listed KA, N, EP and E among their most important customers, none of which A seemed to be aware of. Of these customers, KA was mentioned by KM as currently being particularly important and a company they spent much time working with. By cooperating with KA, supplier KM has developed its industrialisation capabilities as well as its ability to deliver products with very few defects. Fourthly, parts of A's network picture is generalised in the sense that it contains "unspecified" customers using thick film products.

Network pictures related to supplier AS. AS is a company with approximately 60 employees that produce and assemble electronic components. AS produces around 500 different products and have around 60 active customers. Similar to supplier KM, AS also produces PCB's (Printed Circuit Boards), however of larger sizes. AS has been a supplier of customer firm A since around 1990 producing approximately 10-15 different circuit boards for the fire alarm control panels. Customer firm A does most of the development of the circuit boards in-house, involving the supplier AS only at the prototype stage. AS has extensive knowledge about the production of circuit boards which they discuss with A, but apart from that, supplier AS simply produces circuit boards from already made technical specifications. For some time, customer firm A has experienced that supplier AS has been unable to deliver the amount of products they have agreed upon. This has caused problems at customer firm A as they could not keep the desired production rates. Customer firm A assumes they are among the ten largest customers of AS, but because of these problems they are unsure about the extent to which they get priority from AS. They do not get any clear answers regarding this, and they assume that the capacity problems at AS stem from higher priority of other customers; however they have no idea who these customers are. AS prefers to produce complete products and also conduct the testing of these products for its customers. Today, AS assembles complete products for approx 5 customers, representing approximately 40% of AS's turnover. AS would like to produce and test the PCB's they deliver to customer firm A. However, customer firm A wants to continue to handle testing internally. AS gets the impression that customer firm A wants to operate independently of its suppliers and thereby be able to switch suppliers quite easily. The largest and most influential customer of AS is FB, a world-leading manufacturer of biomedical test and simulation products for the healthcare industry. AS produces PCB's for this customer as well as assembling complete products. The close cooperation with FB has been very important for the development of AS's capabilities for producing complete products as well as cooperating with a global, demanding customer. According to AS, much of the learning in the relationship with FB is used in AS's other customer relationships. If customer firm A wanted AS to produce a complete

product, knowledge from assembling complete products for FB could be utilised. Another important customer of AS is the largest independent research organisation in Scandinavia (S). This research organisation develops very complex circuit boards, and it is very innovative when it comes to developing and using new technology. Therefore, having a close relationship with this customer is important for developing new knowledge regarding the functionality and production of PCB's at AS. The cooperation between the companies can e.g. entail finding solutions for producing a circuit board in the more optimal way, i.e. by making the manual control more efficient. Customer S is the most challenging customer AS has, and the companies spend much time developing products in collaboration. The network pictures of customer firm A and the supplier AS are shown in figure 3. The network picture of A is in this case *incomplete*. Customer firm A does not have any insight into which other customers AS has even though A believes that other customers of AS are causing capacity problems at AS. According to an interviewee in customer firm A; *"We believe that some other customer(s) are the reason why our deliveries are delayed... we don't get the number of circuit boards we have ordered..., however we feel that there is not enough openness regarding who these customers are and what causes the delays"*.

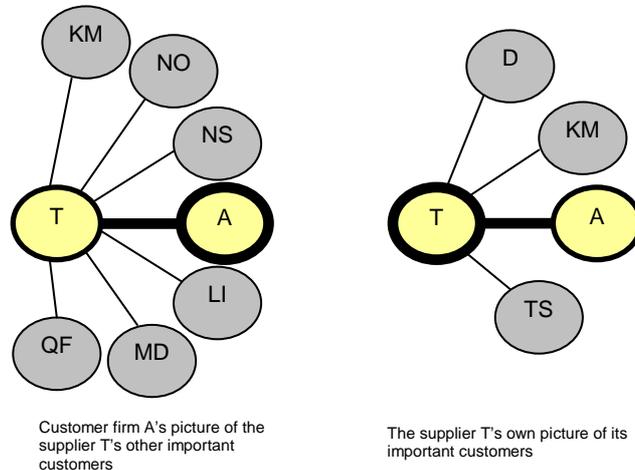
Figure 3: Customer firm A and supplier AS



Network pictures related to supplier T. T is a mechanical company that specializes in creating products based on thin steel plates. The company has 15 employees, most of them working with production. The main capability of T entails construction of thin plates for different purposes and production techniques. T was earlier a part of customer company A, but was outsourced in 1995 as a part of A's strategy to become a more focused company. Since then, T has been a large supplier of A. T produces a number of different products (around 250) for A. The main products are different steel cabinets which are used for fire alarm control panels. When developing a new product, e.g. a steel cabinet, the R&D department at A makes the initial specifications. The drawing, usually made in a CAD-programme, is then sent to T and a prototype is made. T has extensive knowledge of A's requirements and they often have suggestions for adjustments which are discussed with A's R&D department. The design and "how to find the most economical and production friendly solution" are the main discussion points. Since T is localised just a few metres from A, it is easy for the technical drawers at A to walk over to T for advice and suggestions. Because of the long-lasting relationship between T and A, a lot of knowledge regarding each other's businesses has been acquired over the years. Many of the employees from before T was outsourced are still working in the two companies and these "old" employees in A have much insight into the customer base of T. This knowledge is primarily based on the customer relationships T had some years ago. However, it seems like knowledge regarding T's new, important customer relationship is lacking. Furthermore, the persons who have become employed in A after the separation of A and T do not have the same insight into T's earlier operations. These individuals are not a part of the history that has taken place between the two companies and need to learn how the cooperation functions and what capabilities T has that are important for A. A believes they are the largest customer of T, a situation which A finds somewhat unfortunate. T will be in a vulnerable position if A decides to find another supplier of steel cabinets. Totally, T has 200-250 customers most of which are quite small, however one other very large customer of T is KM. According to T, 60% of all sales come from KM and A, quite evenly distributed across the two customers.

The network pictures of customer firm A and supplier T are shown in figure 4. The network picture of A is partly *incomplete*. Customer firm A does not include D and TS as important customers of T, possibly because the relationships to these two customers have been established quite recently. The network picture of A is also partly *obsolete*. Five of the customers A regards as important for T (NO, NS, LI, MD and QF) were important customers of T a few years ago, but they are not so large and important today.

Figure 4: Customer firm A and supplier T



Based on the four pairs of network pictures, we suggest that the following concepts can be useful for discussing, in more detail, the congruence between the customer's and the supplier's supplier-related network pictures:

- *Obsolete*; parts of a network picture may be obsolete in the sense that they are no longer correct although they were correct at an earlier point in time. Since a company's network is in constant flux, one issue therefore becomes how often a company should update its insight into its suppliers and their related networks.
- *Incorrect*; parts of a network picture may be incorrect in the sense that some elements are incorrect and, furthermore, have always been incorrect. One issue then becomes how a customer should acquire information and insight so that misunderstandings and wrong supplier network pictures can be rectified.
- *Generalised*; network pictures may be generalised in the sense that some parts of the network picture are unspecific, aggregating specific counterparts or other items into groups at a higher level, e.g. "customers within the shipping industry". One issue then becomes to what extent a customer should aim to acquire insight into the specific contents of the aggregate categories in its supplier network pictures.
- *Incomplete*; network pictures may be incomplete in the sense that the network picture of the customer is less comprehensive than the network picture of the supplier. One issue for the customer is then to what extent it should acquire additional insight and add new elements in order for the supplier network picture to become more complete.

### What benefits may ensue from changing the supplier-related network picture?

So far, we have focused on the congruence between the supplier-related network picture of a customer and the corresponding network pictures of the suppliers. We identified a number of different ways in which these pictures may be incongruent. However, having identified such incongruities, one issue is which benefits a customer firm may obtain from changing its network pictures. In other words, is it relevant and worthwhile for a firm to develop its supplier-related network picture, and thereby increase its understanding of the relevant network contexts of its main suppliers? In order to assess whether it might be relevant for a firm to develop its supplier-related network picture, we asked the former Purchasing Manager of customer firm A, who has recently switched job and now works as the Purchasing Manager of supplier KM. As a result of his career move, the Purchasing Manager had changed his network picture and he had acquired insight into several elements of the network of which he was unaware at the time when the first interviews with him (and the other interviewees) were carried out. The following examples show a number of

elements, coined “supplier-related network potentials” which, in the view of the former Purchasing Manager, could have led to a different way of handling the relationship to the suppliers if the customer company had been aware of the potentials and thereby able to act on them.

*Network potentials related to supplier OP.* Customer firm A had not been aware of OP’s relationship to TD (cf. figure 1). Having gained additional insight into the relationship between supplier OP and its customer TD, the former Purchasing Manager points out two areas where this insight might have influenced the way in which the customer firm A managed the relationship with OP. *Firstly*, he has got the impression that OP and TD have cooperated on increasing production automation so that TD do not have to assemble components by hand after delivery. This type of knowledge could possibly be transferred to customer firm A. However, he believes that OP faces very strict demands from TD in this area. TD’s quality requirements appear to be much higher than customer firm A and, consequently, investing in such automation equipment might not be cost efficient for customer firm A. On the other hand, knowledge about automation could be valuable for customer firm A in order to produce more cost efficiently. *Secondly*, the former Purchasing Manager pointed out that knowledge about plastic materials is an area where OP has developed insight from the relationship with customer TD. OP’s knowledge regarding different types of plastic materials could have been utilised by customer firm A to assess whether other types of plastic materials than what they use today could have been implemented.

*Network potentials related to supplier KM.* Customer firm A had not been aware of KM’s relationship to customer KA (cf. figure 2). Having gained additional insight into the relationship between supplier KM and its customer KA, the former Purchasing Manager points out three areas where this insight might have influenced the way in which the customer firm A managed the relationship with KM. *Firstly*, customer firm A could have benefited from the strong industrialisation capabilities of KM. Through its relationship with KA, KM has developed skills in bringing a development project via the prototype stage through to full production. By being involved in several stages KM has a much better chance of obtaining the most optimal production process. These skills could have been transferred to KM’s relationship with customer firm A. *Secondly*, supplier KM has developed knowledge about how different components can be placed on the circuit boards to gain maximum production efficiency. The knowledge about the layout of electronics on the circuit boards could have been used by customer firm A to achieve lower production costs. *Thirdly*, with insight into the relationship between the supplier KM and KA and what these companies have accomplished together, A could have benefited from KM’s capabilities in responding to very demanding quality requirements. KA’s quality standard is 25 parts-per-million (ppm) whereas customer firm A’s standard is 5.000 (ppm), a significant difference. Customer firm A could have utilised these capabilities to meet higher quality standards and improve the way they work with quality control systems.

*Network potentials related to supplier AS.* Customer firm A had not been aware of AS’s relationship to FB (cf. figure 3). Having gained additional insight into the relationship between supplier AS and its customer FB, the former Purchasing Manager points out one area in which this insight might have influenced the way in which the customer firm A managed the relationships with supplier AS. In his view the most important knowledge AS has learned from the relationship with the customer FB is related to assembling complete products and making the final testing before sending the products directly to the end users, i.e. not FB. Since customer firm A does all final assembly and testing internally, this knowledge is not so useful for customer firm A. On the other hand, and in relation to this knowledge, the former Purchasing Manager points out that supplier AS has acquired new skills in producing and testing very complex circuit boards via the relationship with customer FB. This knowledge could have been useful for customer firm A, since the supplier AS also produces very complex circuit boards for customer firm A.

*Network potentials related to supplier T.* Customer firm A has an obsolete network picture with regard to supplier T (cf. figure 4) and thus it is not updated on the current important counterparts of supplier T. Having gained more insight into supplier T, the former Purchasing Manager realised that this insight might have influenced the way in which customer firm A could have managed the relationships with T. A lot of the “older employees” at customer firm A bring with them “the old network picture” of supplier T where the supplier had relationships with what these employees

consider to be important customers, such as QF and NO, which are well-known companies in the part of the country in which customer firm A is situated. These employees still use supplier T because it has knowledge and skills which have been developed in the relationships to these customers and which are useful in relation to customer firm A. On the other hand there are a lot of “new employees” at customer firm A who do not bring with them “the old network picture” of supplier T. They are not familiar with the history of the supplier and thus have a somewhat different view of supplier T’s capabilities. Since they have a “less obsolete” network picture they are also more aware of the new customers of supplier T. This insight knowledge could have been utilised by customer firm A in order to partly modify the relationship to supplier T.

Based on the examples of network potentials described above, we suggest that the following issues may be useful to consider in relation to the network potentials which a customer firm may become aware of when changing its network pictures. *Firstly*, if a company changes its supplier-related network picture, it may identify a lot of elements. Some of these elements are *not considered particularly relevant* for how the customer company manages its supplier relationships. However, others may be *considered very relevant* for the customer company and its relationship to the supplier. As the former Purchasing Manager expresses it “*had we known this when I was head of purchasing at customer firm A, it would have affected how we had managed the relationship to the supplier.*” The elements which are considered relevant and would have changed the actions (management) of the company (and its managers) we coin “*supplier-related network potentials*”.

*Secondly*, in the particular case study, we primarily identified supplier-related network potentials which regard technical capabilities, automation capabilities, materials knowledge, innovation capabilities, quality control capabilities, assembly capabilities, or organisational capabilities of the suppliers which they have developed in relation to their other customers. Consequently, we may define this type of supplier-related network potential as “*a resource element which a focal customer views as potentially valuable to transfer from the supplier and its other relationships to its relationship with the focal company*”. This definition is in line with the concept of resource heterogeneity in the Industrial Network Perspective which is often used to refer to the assumption that the value of a resource depends on which of its dimensions are used and for which purposes. If we view a supplier as a resource, finding such resource-related supplier-related network potentials implies finding new/additional dimensions of a supplier (and its related networks) which may be used by, and hence prove valuable for, the customer company.

*Thirdly*, the particular type of “network potentials” we have identified in our single-case study are akin to the concept of “*resource transferability*” suggested by Anderson et al. (1994) in their discussion of how dyadic business relationships are embedded within a business network context. Resource transferability concerns the “use and transfer of solutions and knowledge” to a focal relationship *from* other relationships, or *from* a focal relationship *to* other relationships. Therefore, in line with the additional concepts suggested by Anderson et al. (1994) we may expect that it is possible to also find “supplier-related network potentials” related to “*activity complementarity*” or “*actor-generalizability*”. Activity complementarity concerns “positive volume effects” or “positive qualitative effects” between a focal relationship and other connected relationships. Actor generalizability concerns “harmonious signalling to other parties” or “attractive connectedness of partner” in a focal relationship viewed in the light of other connected relationships. In a similar vein, it may be possible to find “negative” network potentials which may lead the customer firm to delimit or reconsider its relationship with a supplier since these elements are not viewed as adding positively to the relationship between the customer and the supplier, cf. the concepts of “*resource particularity*”, (e.g. if it finds out that a supplier primarily focuses on offering products or developing capabilities which are not so relevant for the customer firm, it might consider changing its relationship to this supplier) “*activity irreconcilability*” (e.g. if it finds out that a supplier gives priority to producing products for other customers, it might consider changing its relationship to this supplier) and “*actor-relation-incompatibility*” (e.g. if it finds out that a supplier engages in relationships to competitors of the customer firm or has been acquired by a firm which is viewed as an unfavourable connection, it might consider changing its relationship to this supplier).

*Fourthly*, we may note that network potentials may not only be identified in relation to a recent change of a network picture. Some network potentials may have been identified long ago, but the

customer may not have had the time or given priority to attempts at realising the potentials. Hence, when the network picture changes and a network potential is identified for the first time, the elements will be of the type “a hitherto unknown resource element...”.

Lastly, the potentials are only potentials, which means that attempts at trying to realise them may turn out to be in vain which, in turn, would lead to a revision of the customer firm’s supplier-related network picture, no longer identifying the elements as “potentials”.

**How to find hitherto unknown supplier-related network potentials?**

In the preceding section, we established that there may be valuable, hitherto unknown supplier-related network potentials to find beyond the present network picture of a company. Furthermore, if a customer firm views it as important to make better use of its suppliers and explore the potentials related to the suppliers’ network contexts, it needs to consider how it may go about finding them. As the Purchasing Manager stated in discussions with us, “there is little time to allocate to systematic search for unknown possibilities related to our suppliers”. In table 1, we offer a matrix which describes four different strategies for how a company may go about changing its supplier-related network pictures and finding hitherto unknown network potentials. The first dimension represents “how the company looks for network potentials” and varies from “systematic efforts” to “unsystematic efforts” at finding network potentials. The second dimension concerns “what network potentials the company looks for” and captures the extent to which the company is aware of the particular network potentials (i.e. “themes”) in which the company would like to have more insight. This dimension varies from “specified theme” to “unspecified theme”.

Table 1: Strategies for finding network potentials

|   |                  | Does the company know which network potentials (“themes”) it would like to know more about? |                         |
|---|------------------|---|-------------------------|
|   |                  | Specified theme   | Unspecified theme       |
| How does the company look for network potentials? | Systematically   | 1. Systematic Search  | 2. Systematic discovery |
|   | Unsystematically | 3. Chance Search  | 4. Chance Discovery     |

The dimensions in the matrix can be related to the concepts of ignorance, search and discovery, as proposed by Kirzner (1973). Kirzner suggested that there are two types of ignorance which individuals must cope with in the world. The first one concerns things we know we do not know, and we remain ignorant of them because we do not think it is worth the effort to gain knowledge about them. If we should change our mind and find it worthwhile to acquire knowledge about such elements, we could *search deliberately* for the missing knowledge. The second type of ignorance concerns things which we do not know that we do not know, also coined “*sheer ignorance*”. According to Kirzner, such ignorance is dispelled by *discovery*, i.e. we cannot amend sheer ignorance by deliberate search but only by spontaneously being “*alert to new possibilities*”. In the Industrial Network Perspective, Kirzner’s (1973) distinction between “ignorance-deliberate search” and “sheer ignorance-accidental discovery” has also been discussed, e.g. by Snehota (1990) and by Håkansson (1993). Kirzner (1973) connects search to known ignorance, and discovery to sheer ignorance. Thereby, he primarily covers cells 1 and 4 in the matrix below (possibly also cell 3, if alertness is viewed as specified theme). Somewhat contrary to this, we suggest that the manner in which one looks for something, and the extent to which one is ignorant about the objects of ones attraction, may be regarded as two separate dimensions. Thus, the main difference between Kirzner’s and our view consists of cell 2 “systematic discovery” and cell 3 “chance search”. Below we discuss the 4 different strategies, and in relation to each, we also indicate the former Purchasing Manager’s reaction to its relevance for the customer firm and its supplier-related context.

Systematic search. When a company searches systematically for network potentials it means that it makes an organised effort at finding more information and getting more insight into particular themes which are viewed as relevant for the company. In relation to resource-related supplier-network potentials, a company may make systematic reviews of the capabilities of a supplier, the supplier development programmes it is involved in, the types of quality control systems it adheres to, the quality demands it can handle, its technical development initiatives related to other counterparts,

its product development capability, its other main customers etc. Use of questionnaires, benchmarking studies, and theme-structured dialogues between the company and its suppliers are ways of systematically searching for network potentials.

The former Purchasing Manager views this strategy as very relevant, because it focuses on investigating a specified theme. For customer firm A, the most relevant themes are quality control systems and environmental assessment systems. Such systems are very demanding to develop and it is important to get inspiration from other firms and learn how others have handled specific issues. Furthermore, since there is no competition regarding such systems, he expects it to be possible to openly discuss opportunities and problems, and that it is possible to transfer knowledge among the different customers of a focal supplier. Major disadvantages are that the strategy is time consuming to employ, and that some themes will be difficult to discuss explicitly, e.g. efficiency where he thinks that the different customers of the focal supplier will hesitate to share information.

Systematic discovery. Systematic discovery entails that while the objects of discovery (i.e. potentials) are relatively unknown, the company has some idea as to where to search for them. For example, if a company makes a systematic search effort at acquiring more insight into its suppliers and their capabilities, development initiatives etc. as described above, it may at the same time include some “open questions” in the questionnaire where the supplier is encouraged to take up issues which they believe may be relevant for the customer but which the customer is not presently aware of. In a similar manner, in structured supplier dialogues time may be set aside for themes which suppliers can bring up. However, systematic discovery may also include the recurrent, systematic organisation of, or deliberate participation in, fora, arenas, channels or portals where the customer may meet its suppliers and their other counterparts, but where there are “open themes”, or where time is set aside for informal “networking”. 2-way supplier relationship assessment programmes (RAP), where not only the customer but also the supplier evaluates the relationship in a structured manner, may also facilitate a form of systematic discovery. These may include systematic collection of the suppliers’ ‘ideas for improvement’ – and the performance evaluation of the supplier may involve measures as to how many suggestions per key contact person etc. Deliberate, temporary interfirm employee transfers also offer an opportunity for systematic discovery. Open innovation models such as “connect and develop” are also forms of systematic discovery; implying that a company creates positions and organise processes in order to enable systematic identification of external ideas which the company can leverage. Structured supplier networks which “aim to share and transfer knowledge via the use of organised learning routines” offer the possibility for systematic discovery. Structured supplier networks which “aim to commercialise innovations made by suppliers” is another way of organising for systematic discovery. Systematic discovery is particularly relevant to consider in relation to potentials *discovered by the supplier*. If the supplier identifies *customer-related network potentials, structures and processes* needs to be in place so that these can be brought to the attention of the customer firm. Opportunity may come knocking at your door, but there has to be a door to knock at and opportunity (i.e. the supplier having discovered a potential) has to know something about what is behind the door in order to choose which door to knock at it, and how to find the door. Therefore, a company may consider how it can design a mix of procedures for systematically discovering unknown network potentials.

In the view of the former Purchasing Manager, this strategy also has merits, but he was quick to point out that a major disadvantage is that it may be very time consuming. Furthermore, the strategy is probably only possible in very close relationships where the two firms have worked together for a long period of time and have a 3-5 years time horizon on their further collaboration. Using this strategy requires that the top management teams in both firms need to be strongly committed and look upon the method as a strategic way of managing relationships, if not they will not share relevant information. In addition, for a small firm only 2-3 such relationships are possible to use the strategy on. The main advantage is that one may actually identify potentials by working much more closely with a few suppliers and by having an open dialog and develop “competitive advantages” in a collaborative manner.

Chance search. Often a customer company is aware of issues and themes which are important to it, but does not (continuously or recurrently) make a systematic effort at acquiring new insight into these. There is simply not sufficient time and resources to inquire into all themes of some or

possible importance to the firm. Instead, the customer company engages in daily or at least recurrent interaction with its suppliers, where the main issues concern e.g. deliveries, product adaptations, problem solving, product development, quality control, ordering procedures etc. However, in the *interaction* which relates to these issues, other themes may come up as an “interactive effect” (Håkansson, 1987) – and if the customer company is interested in these themes, it may be alert to the theme and note the insight it has gained into “network potentials”. For example, during a discussion on logistical issues, the supplier may mention that it has recently developed a new logistics solution for another customer and that the logistics solution was related to a new product feature it has developed for this other customer. If the customer company is “generally” interested in this type of feature, it is probable that it will note it and possibly act on the insight. In relation to *chance search*, the managerial challenge is to ensure that the insight is noted in a more systematic manner, either by oral or written communication. It is likely that an enormous amount of insight from chance search is continually generated – possibly every time a representative of the customer company interacts with the supplier company. However, most of it may be remembered only by the individuals who were exposed to it, if remembered by them at all. The challenge is to be aware of which themes are important and to design procedures for capturing, debriefing and documenting theme-related potentials gained from chance search, and a culture in support of this. Thus, internal knowledge management is important to consider.

The former Purchasing Manager views this strategy as useful if the people involved in the daily dialogue with the suppliers are used to interacting closely with the supplier, discussing issues and noting comments with could lead to potentials being revealed. The main advantage is that this method is much less time consuming than the two discussed above, and can be carried out in an informal manner. The main disadvantage is that it may be difficult to get relevant information if the discussion is not part of a formal collaboration strategy approved by the top management.

*Chance discovery*. Chance discovery occurs when a company neither organises systematic efforts at acquiring insight nor has been particularly interested in gaining insight into a particular theme. However, themes may come up by coincidence in daily interaction or unplanned fora which may catch the attention of the customer company, perhaps because it may be a solution to a problem for which no solution has yet been identified, or perhaps because it seems to offer a potentially interesting novel connection to the customer company’s current businesses. Such themes will be of the type “this may be interesting for us to look into”.

The former Purchasing Manager of customer firm A had difficulties with seeing any advantages with this strategy, because there is no systematic approach and no specific theme guiding the investigation. He could, however, see a lot of disadvantages, e.g. difficulties in getting access to relevant information, too broad a scope to get detailed information, time consuming (due to lack of focus on specific themes) etc.

### **Conclusions and implications**

A company may consider if parts of its network pictures are incomplete, incorrect, obsolete or generalised, and if such incongruities matter for the manner in which it manages its suppliers and the network pictures are in need of revision. If the company revises its supplier-related network pictures, it may find valuable, hitherto unknown supplier-related network potentials which may form the point of departure for changing certain parts of the relationships to the suppliers. In order to revise its supplier-related network pictures and gain additional insight into its supplier-related networks, a company may employ different strategies: systematic search, systematic discovery, chance search, and chance discovery. In general, it is a question of how much time, personnel and other resources a company should allocate to the four different strategies. Furthermore, the allocation issue concerns several levels: individuals involved in the supplier relationships, the purchasing function, the company level etc. Also, resources allocated to the discovery of hitherto unknown supplier-related network potentials compete for resources for already known network potentials, as well as for resources for other purposes. Therefore, it may be particularly relevant to consider this issue in the case of ‘mature/stable’ relationships (Ford, 1980) where most of the relationship has become routinised. Identifying a hitherto unknown network potential may enable the revival of the supplier relationship and evoke a new wave of development and exploration in the relationship.

Further research is required into network pictures, in general, but more particularly there is a need for investigating how companies use network pictures for managing in their network context as well as the strategies companies use for systematic or serendipitous revision of the pictures. Contrasting or amalgamating network pictures held by different individuals within or across firm boundaries are issues which further research could address. Furthermore, strategies for updating network pictures may be scrutinised, and whether the updating is done by either or both of the firms directly engaged in the relationship, or whether third parties are used for providing information for updating the network pictures. In addition, there is a need for research into network potentials, their types and the reasons why some potentials are acted upon and others are disregarded or stored for later exploration. We have addressed these issues in relation to supplier relationships and networks, and there is a need for more research into supplier-related network pictures but also for research into customer-related network pictures.

## References

- Anderson, J.C., Håkansson, H. and Johanson, J. (1994) Dyadic Business Relationships within a Business Network Context, *Journal of Marketing*, Vol. 58, pp. 1-15
- Dyer, J.H., Cho, D.S. and Chu, W. (1998) Strategic Supplier Segmentation: The Next "Best Practice" in Supply Chain Management, *California Management Review*, Vol. 40, pp. 57-77
- Ford, D., Gadde, L.-E., Håkansson, H. and Snehota, I. (2003) *Managing Business Relationships* (2nd ed.). John Wiley & Sons., Chichester.
- Ford, D. and Redwood, M. (2005) Making sense of network dynamics through network pictures: A longitudinal case study, *Industrial Marketing Management*, Vol. 34, pp. 648-657
- Gadde, L.-E. and Håkansson, H. (1993) *Professional Purchasing*. Routledge: London
- Henneberg, S.C., Mouzas, S. and Naude, P. (2006) Network pictures: concepts and representations, *European Journal of Marketing*, Vol. 40, No. 3/4, pp. 408-429
- Holmen, E. and Pedersen, A.-C. (2003) Strategizing through analyzing and influencing the network horizon, *Industrial Marketing Management*, Vol. 32, pp. 409-418
- Håkansson, H. and Eriksson, A.-K. (1993) Getting Innovations Out of Supplier Networks, *Journal of Business-to-Business Marketing*, Vol. 1 (3)
- Håkansson, H. and Johanson, J. (1993) Industrial Functions of Business Relationships, in *Advances in International Marketing*, Vol. 5, D. Deo Sharma (Ed.), Greenwich, JAI Press, pp. 15-31
- Håkansson, H. and Snehota, I. (1989) No business is an island: The network concept of business strategy, *Scandinavian Journal of Management*, Vol. 5, pp. 187-200
- Håkansson, H. and Snehota, I. (1995) *Developing relationships in business networks*. London: Routledge.
- Kirzner, I.M. (1973) *Competition and Entrepreneurship*, University of Chicago Press, Chicago.
- Lakemond, N., Berggren, C. and van Weele, A. (2006) Coordinating Supplier Involvement in Product Development Projects: a Differentiated Coordination Typology, *R&D Management*, 36, 1, pp. 55-66
- Lamming, R. (1993) *Beyond Partnership: Strategies for Innovation and Lean Supply*. Prentice Hall
- MacDuffie, J.P. and Helper, S. (1997) Creating Lean Suppliers: Diffusing Lean Production Through The Supply Chain, *California Management Review*, Summer, Vol. 39, No. 4
- March, J.G. and Simon, H.A. (1958) *Organizations*. John Wiley & Sons
- Mota, J. & de Castro, L.M. (2005) Relationship portfolios and capability development: Cases from the moulds industry, *Journal of Purchasing and Supply Management*, Vol. 11, pp. 42-54
- Mouzas, S. and Naude, P. (2007) Network mobilizer, *Journal of Business & Industrial Marketing*, Vol 22, No 1, pp. 62-71.
- Mouzas, S., Henneberg, S. and Naude, P. (2008) Developing network insight, *Industrial Marketing Management*, Vol. 37, pp. 167-180.
- Nobeoka, K., Dyer, J.H. and Madhok, A. (2002) The Influence of Customer Scope on Supplier Learning and Performance in the Japanese Automobile Industry, *Journal of International Business Studies*, Fourth Quarter, Vol. 33, Iss. 4, pp. 717-736.
- Simon, H. (1976) *Administrative Behaviour* (3<sup>rd</sup> ed.). New York: The Free Press
- Ritter, T. (2000) A framework for analyzing interconnectedness of relationships, *Industrial Marketing Management*, vol. 29, pp. 317-326
- Wynstra, F., van Weele, A. and Weggemann, M. (2001) Managing Supplier Involvement in Product Development: Three Critical Issues, *European Management Journal*, Vol. 19, No. 2, pp. 157-167
- Öberg, C., Henneberg, S.C. and Mouzas, S. (2007) Changing network pictures: Evidence from mergers and acquisitions, *Industrial Marketing Management*, Vol. 36, pp. 926-940.