

Managing knowledge with networks. Knowledge networking concepts in four major companies

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ABSTRACT

Attempts to manage knowledge in a corporate environment abound. Knowledge networks - intra-organizational networks of employees with valuable knowledge to share - are an increasing phenomenon. Using knowledge networks to manage knowledge transfer and creation can extend from setting up single networks with very selected employees, e.g. to increase innovation in a specific area of a company's competencies, to the integration of a new organizational layer not yet included in a network, as well as to many networks focusing on the same business process or goal. Those networks are organized in concepts and build a distinct system linked to the core organization in order to enfold their competency to build actionable knowledge. However, theory hasn't as yet acknowledged this form of managing knowledge. This paper describes the latter networking concepts in four major companies. It describes the core elements of and the success factors for knowledge networking concepts as derived from a comparative case study of four companies' concepts. The case studies prove that knowledge networks won't work effectively without taking elements such as a strong link to corporate strategy and objectives into account. In addition, research presented in this paper shows how important it is to adapt knowledge networking concepts to a company's unique culture and organizational structure.

INTRODUCTION

Providing the missing link between knowledge management and real competitive advantage is the success factor that could shape an industry. Companies are therefore constantly searching for new, effective ways through which to share valuable existing knowledge and create new knowledge for innovation. In fact, since Nonaka (Nonaka et al., 1995) we know that specially tacit knowledge is the nugget to dig for. But only a few attempts have been made to share and expand a company's tacit knowledge base - that knowledge that is tied to the minds of its employees and therefore hard to reach (e.g. Brown and Duguid, 1991; Wenger et al., 2002; von Krogh et al., 2001).

Transferring employees who are renowned experts in their field to a different department will indeed transfer their valuable tacit knowledge from one part of a company to another, but without multiplying it to thus increase its use. Because knowledge is context bound, these experts can't easily articulate their knowledge, or may even be unaware of the knowledge that they have (Nonaka, 1991). Articulation of tacit knowledge becomes easier when exchanging it with other experts while solving problems or improving processes, in other words, when creating the right context for knowledge sharing. People can't be forced to share their knowledge, but one can motivate people to do so by, e.g., creating the appropriate environment, recognizing these employees as experts in their field and using the experts' knowledge in a meaningful way (von Krogh et al., 2000).

In the light of the above, it becomes clear that companies need to face various challenges in order to improve their knowledge sharing and creation, especially if they deal with less imitable, and therefore more valuable, tacit knowledge. Knowledge networks as an organizational structure within companies can be one solution with which to solve the above-mentioned problems, since experts can come together and share their tacit knowledge while solving crucial corporate problems, thus creating real value with actionable knowledge (Seufert et al., 1999).

The downside is that knowledge networks need to be integrated into a concept if they are to unfold their full corporate potential and return the investment made. While focusing on the structure and potential of single organizational forms, research has largely forgotten to examine the concepts behind them - the concepts that could be crucial for success (e.g. Hedlund, 1994; Bartlett & Ghoshal, 1989; Prahalad &

Doz, 1987). This paper therefore focuses on knowledge networking concepts that were implemented in four major companies. In order to derive the core elements and success factors, these concepts are compared in a cross-case analysis and thereafter developed into a model of those knowledge-networking concepts that are crucial for leveraging companies' tacit knowledge base. The paper will answer the question: What shapes knowledge networking concepts and which components are crucial for success?

BACKGROUND: THE KNOWLEDGE NETWORK APPROACH

Both in practice and research the sharing and creation of knowledge are regarded as key to gaining competitive advantage. The sharing of valuable tacit knowledge, i.e. experts' experience and mental concepts, is only possible by connecting these experts (von Krogh et al. 2001). Networks have been analyzed in a variety of ways and through different theoretical lenses in organizational studies (Nohria, 1992; Oliver and Ebers, 1998). Nevertheless, research hasn't sufficiently distinguished between the various organizational forms called knowledge networks.

Büchel and Raub (2002) use the term knowledge network for a community of practice with representatives from different companies, Newell and Swan (2000) use the term when referring to informal networking between different companies, Brown and Duguit (1991, chapter 5) use it for networks that connect various communities of practice within an organization. In his latest publication Hansen (2002) uses it to describe the connection between project teams in multiunit companies, whereas Collinson and Gregson (2003) use the term knowledge networks to describe networks between entrepreneurs and venture capitalists in incubators.

Attempts to define certain forms have also failed, while researchers tend to extend or change their definitions over time to suit the market (compare, e.g., the definitions of communities of practice in Wenger 1998 and in Wenger et al. 2002). For this article the term knowledge networks is used when a company purposely sets up a formal network of experts, who are not otherwise hierarchically or structurally connected, to fulfill a specific goal linked to the corporate strategy. This goal can be attained by solving problems, discussing best practices, or improving processes, thus sharing tacit knowledge and

creating new knowledge. The definition is based on the first attempts by Seufert et al, 1999 and the work of the KnowledgeSource research team (e.g. Enkel et al., 2004b).

First conceptualized by Seufert et al. (1999), interest in research on the topic of knowledge networking has increased during the last few years. In addition to Enkel & Back (2002) and Back et al. (2003) who describe companies' knowledge networks' structure and embeddedness on a general level, Vassiliadis (2003) provides case studies of the Greek consultancy business in this regard. Raimann (2002) developed a service model with which to support knowledge networks with IT in different phases of the lifecycle, and Seufert et al. (2004) developed a methodology for setting up and maintaining them. The latest research focuses more on specific fields in which networks can unfold their full potential (e.g., Enkel et al., 2004c developed a framework and methodology for setting up and adapting knowledge networks to support companies' growth strategy focussing on innovation). All these studies focus on single networks, research has forgotten to take a broader perspective on the subject of which corporate strategy could be supported by using knowledge networks systems within the company. The proposition of this article is that knowledge networks need to be integrated into a concept to unfold their full corporate potential and to return the investment made.

METHODOLOGY

These research is designed in a *three-step approach*: the first step is to analyze the theory from different research streams in order to create a framework (called analyzing frame) suitable for collecting all data needed for analyzing systems of knowledge networks in companies. The second step is to collect data with the analyzing frame within four major companies, using networks and conducting four within-case-analyses in order to deduce the core elements for networking concepts. In a third step a comparative analysis is made with propositions formulated to identify the relationship between the core elements. These propositions are tested on the collected data and lead - if supported - to hypotheses that formulate how knowledge networks are managed successfully.

A qualitative method was chosen as the best way of analyzing successful practices and generalizing the findings for theory building. Concerns regarding the external validity were traded off against the opportunity to gain insights into an as yet incompletely understood phenomenon (Eisenhardt, 1989). If a phenomenon of practice as well as its processes and relationships needs to be examined holistically and in detail, qualitative methods can cover these requirements better. If a single premise needs to be deduced from a broad set of data, quantitative methods will serve best (Miles & Huberman, 1994, p. 10). This study follows a qualitative approach in observing and describing knowledge network concepts in practice. In keeping with Eisenhardt's (1989) demand for theory-building cases studies, this study aimed to discover the structure of knowledge networking concepts integrated within four companies through case study research. I selected the companies according to criteria that helped to standardize the instruments used and to allow the later generalization of the findings. One criterion was that the companies needed to have implemented the network approach - as one important instrument of their knowledge management activities - for a period of not less than two years. All companies are from knowledge-intensive industries (automotive, IT and fast moving consumer goods) because of these companies' needs to establish successful practices for managing knowledge. The degree of their experience with and implementation of knowledge networks means that within this time span the data collected show the networks' adaptation to their companies' specific needs. These companies would also have monitored their success, which would not have been the case if the networks' lifetimes were too short and no or very little experience had been gained from success and failures. Furthermore, the companies selected are from three different industries to exclude possible industry-specific aspects. Two companies are from the IT industry, one from consumer goods and one is an automotive company, but all are global players in their industry. For confidentiality the companies are called Autocorp, ComputerCorp, ComputerCorp and CompConsult in this article.

To eliminate the company- and task-specific aspects of the networks examined, I conducted a comparative case study that mirrored only the common components and therefore helped to generalize the findings. The analysis of the data, gained over 18 months in 2002 and 2003, was conducted using pattern

matching (Yin, 1994, p. 106). I derived the patterns from theory by formulating propositions and testing them with the analyzed data (see Eisenhardt, 1989, p. 540f). The paper is based on the results of the author's dissertation project.

In keeping with the trend of a multi-method approach as a research strategy (e.g., Mintzberg, 1979, p. 587 and Miles & Huberman, 1994, p. 2), the data collection includes several sources of evidence, which ensures validity through triangulation. Besides the interviews, which were the main and most valuable source of evidence, questionnaires, archival data and documents were analyzed over a 18-month period to obtain a complete picture of the knowledge network approaches of the investigated companies.

The following table lists the **interview** partners (in total **48**) by function. These functions are each representative of persons involved in developing and maintaining a networking concept, thus giving the author valuable insight into the networking approaches. On average, 85% of the people involved within the four companies were interviewed to obtain sufficient data. The interviews took an average of 50 minutes (total of 2480 minutes of interview material) and, as previously decided, had a semi-formalized structure.

Table 1: Number of interviews held

Distribution of Persons Interviewed by Function	
	Number:
Top Management	5
Network Managers	26
Network Coordinators	17
Total	48

The **interview** guidelines were slightly adapted for the individual companies, as well as for the different functions of the interviewees and based on the knowledge gained from the document analysis, pre-interviews and archival data gained beforehand. The interview data was rounded off by a questionnaire, which deduced more detailed information about the structure of individual networks and their success. The **questionnaire** (only 10 questionnaires in the company Autocorp) was only used to back up the interview data in case the analyzed archival data provided insufficient to answer the questions raised.

The analyzed **documents** were business reports, and articles, but mainly internal presentations and documents that reflect internal communication on and the implementation and support of the knowledge network system. The **archival data**, which augmented the interview data and the document analysis, included studies done by the companies to monitor their networking efforts. All archival data and internal documents are confidential and were previously not available for publication. The **19 company visits** conducted in the 18-month data-gathering period of the study were an additional and valuable source of background information that helped to build trust as well as to identify the appropriate interviewees and data sources.

First step: results from theory

Case study research differs from hypothesis-testing research because the latter is focused, from the beginning, on gathering and analyzing data for a prior test of the proposition formulated (Eisenhardt, 1989, p. 539 f.). Case study research claims to investigate a phenomenon holistically and not through the narrow filter of hypotheses. But no researcher can work without having theories or propositions in his mind when investigating a research objective, since this could lead to the gathering of large amounts of unstructured data, thus making data analysis and theory building quite difficult (Eisenhardt, 1989, p. 540 f.). This section will therefore illustrate the constructs to focus data gathering, analysis and presentation by creating an analysis framework.

The theory streams of the *knowledge-based theory of the firm* (characteristics of knowledge, demands for knowledge management activities with reference to strategy support etc.) and *organizational theory* (the linkage between and influence of knowledge-based organizational forms within companies, such as communities of practice or knowledge networks, demands for organizational forms to support knowledge sharing and creation through interaction etc.) were initially used as basis for the development of an analysis framework. *Network theory* with its demands for and the advantages of network structures for knowledge-based organizational forms, the linkage between network members, the linkage between various networks etc., add valuable insights as well. Analyzing these streams led to the identification of core design elements for knowledge networking concepts and, subsequently, to the creation of an analysis

framework with which to focus data gathering and analysis. The analysis framework consists of two dimensions (a macro and a micro perspective) that enable data gathering on the broader strategic level of the organizational culture and structure as well as enabling information gathering on the detailed network level. I used the analyzing framework to focus the data gathering as well as to facilitate the analysis the data is:

Table 2: Analysis framework for knowledge networking concepts (Source: adapted from Enkel, 2003b)

- The strategic link and translation of it to the knowledge networking concept • Shape of the concept • Justification structure of the concept (e.g., relationship between the single networks and the concept's management) • Embeddedness in the organizational structure and culture
- Core elements and their qualities • The knowledge networks' goals and values • Methodology used to set up the concept and the single networks • The networks' working mode • Roles and responsibilities within the concept and in the single networks
- Supportive work and marketing of the concept by the knowledge management unit
- The corporate performance measurement system focused on • Innovation goals and • Network-specific measurement metrics
- Changes to and adaptation of the knowledge networking concept • From project status to daily work • Changes in the network map • Changing activities to support and maintain the system • The system's current and future challenges
- Differences in single networks in respect of: • Operative goals and task • The single network's shape • Success and failure factors

The analysis method of using pre-defined constructs is in line with the pattern-matching method recommended by Yin (1994, p. 106) and Eisenhardt (1989, p. 539 ff.) for theory-building case study research.

For the comparative case analysis that follows, Eisenhardt (1989, p. 540) suggests: "One tactic is to select categories or dimensions, and then to look for within-group similarities coupled with intergroup differences. Dimensions can be suggested by the research problem or by existing literature, or the researcher can simply choose some dimensions." Following this advice, the single cases are compared in respect of propositions based on the differences found through within-case analysis. The identification of new elements and the formulation of propositions to test against the gathered data are necessary to reduce the risk of losing valuable information through a one-dimensional analysis or an incorrect conclusion (Eisenhardt 1989, p. 540 f.). "Overall, the idea behind these cross-case searching tactics is to force

investigators to go beyond initial impressions, especially through the use of structured and diverse lenses on the data.” (Eisenhardt 1989, p. 541).

SECOND STEP: WITHIN-CASE ANALYSIS TO DEDUCE CORE ELEMENTS. FOUR COMPANIES AND THEIR KNOWLEDGE NETWORKING CONCEPTS

When comparing the four knowledge networking concepts it becomes clear that they differ greatly, although all the concepts include knowledge networks with which to support knowledge transfer and creation (of explicit or tacit knowledge). The main differences, as mentioned above, can be found in the number of networks, their penetration within the company, their goals (knowledge and operative goals) as well as in the strategic goals that the concepts should support. The companies’ structure and culture also differ, which might have caused differences in the concepts as well.

The following section briefly describes each concepts’ characteristics in respect of the mentioned criteria.

The Autocorp: How can we create a common knowledge base for our car development?

Autocorp is one of the major companies in automotive transport products and services. It has more than 400,000 employees, a revenue of more than 160 billion € and strategically aims at being a clearly focused and globally acting company, which has made it successful over the past few years. As a merged company, it experienced a successful knowledge network approach in a merged entity and decided to also implement such a network system for its car development unit. The goal was for to link the engineers of the different car platforms to allow them to share lessons learned and to define best practice.

On examining the Autocorp case study it becomes clear that their knowledge network concept pursued the *strategic goals* of increasing efficiency and minimizing risk. Engineers from the car development division have to be linked via knowledge networks to minimize the risk of redundancies and to create synergies in order to increase efficiency in the internal process. Ultimately this will reduce costs through quality improvement in the car development division. Another longer term goal can only be reached through the implementation of knowledge networks in the development of all car platforms: the creation of synergies in development in order to develop components which can be used in different car platforms, not only in one. This would leverage major cost reduction potentials. As long as the different R+D

departments of the various car platforms worked independently of one another and were only responsible for their components without being connected to other platforms, or having no strategic need to cooperate, the development of components for use in various platforms was impossible. The linking of engineers from all platforms through a knowledge network would stimulate great cost reductions while simultaneously providing the chance to formulate common standards and to optimize processes for quality improvement. The implementation of a widespread (throughout Autocorp's car development division) and uniform (all sections were connected through one concept instead of many) knowledge-networking concept was necessary to attain these goals.

This included the forming of a central *knowledge management team* based in the car development division and empowered (linked directly to the overall director of car development) to implement and maintain the concept. This team supported the concept fully, providing courses for those various roles within the concept, advising and offering consulting services, supporting both meetings and the development of a web-based data base. The data base would make their work available on the intranet as well as enable collaboration between the frequent (every second week for one day) personal meetings. The team also implemented several measures with which to monitor the performance of the single networks but haven't as yet succeed in finding an appropriate measurement system. The aim of the KM team is to maintain the performance of the networking concepts to enable long-term competitive advantage through an efficient knowledge management system.

Because Autocorp is a highly hierarchical company, the organizational structure of knowledge networks within the concept was also shaped in a hierarchical way. There are executive knowledge networks connecting the managers, engineering knowledge networks to connect the engineers and steering committees and boards of directors to offer advice. The various parts of this networking concept possess different functions and responsibilities in order to manage and advise other parts. The networking concept translates and copies Autocorp's *hierarchical structure* towards knowledge networks. This adaptation of the concept made it easier for the Autocorp employees in the car development division to accept and live the new concept, because it was familiar to them in its hierarchical structure and formalized *culture*. The

uniform and formal structure of the knowledge networks, including the common operative and knowledge goals, defined processes and tasks etc., also smoothed the way to their acceptance. The procedure, adapted from project works and internal processes, was familiar. To reach the above-mentioned strategic goals, they needed to be translated into adequate operative and knowledge goals for the single networks. The optimization of processes and the formulation of common standards were attained by, first, creating a mutual knowledge base for all car development. This knowledge base needed to include codified tacit (therefore explicit) engineering knowledge describing best practices and lessons learned as well as standards for all components and processes required. The creation of this knowledge base was the main operative goal of the knowledge networks. The codification of engineers' tacit knowledge into explicit knowledge - to enable the transfer of knowledge throughout the car development division - was its main knowledge goal. The single *focus of the network concept* on the car development division was required and sufficient for the proposed goal, which also focused on this part of the company. To connect all knowledge owners within the car development division, approximately 100 similarly structured and sized networks were implemented almost unchanged in the last year.

The Computer Corp: How can we improve our knowledge base for customer support?

Computer Corp is an established IT company, well known for its innovative products and management approaches. The company provides work for more than 80,000 employees and has established 540 sales and service offices in more than 120 countries worldwide. Computer Corp has always had a knowledge-friendly culture. The employees are encouraged to share their knowledge and the company has invested in offices with open spaces, coffee corners for informal talks and supports employees' initiatives, all of which give the company a family feel more than simply a place for work only. Beside its matrix organization, e.g., communities of practice, communities of interest and knowledge networks, ComputerCorp has implemented various, more informal, organizational forms for knowledge sharing.

The ComputerCorp case study is in almost direct contrast to the previous case as far as formalization and number of networks used are concerned. This networking concept too focuses strongly on supporting a business process (customer support) with knowledge networks, but its degree of *formalization* is minimal

(the network structure and work pursue guidelines rather than explicitly stated rules, and there is a high degree of individual adaptation of the single networks). This is based on ComputerCorp's *culture*, which is very informal with flat hierarchies and is knowledge friendly (knowledge sharing is actively supported by the management). The decentralized organizational structure, with the different units having a high degree of freedom and self-responsibility, is replicated in the network concept where there is a high degree of freedom, no central management and self-responsibility for each of the single networks.

This network concept pursue the strategic goals of increasing efficiency and reducing costs in the customer support area through a common data base, which includes support documents of a very high quality to enable the company's customers to solve their problems themselves without having to call ComputerCorp's help desk. The quality of the data base, called InterView, is highly dependent on the documents' quality, their context (which should be appropriate and useful for problem solving), their reader friendliness and actuality. A high quality data base reduces the costs related to customer telephone support through fewer calls being made (more self-solving by customers) and through increased quality, which is achieved by faster support (because all support employees can use the new data base which facilitates the finding of the appropriate problem-solving document without having to revert to finding the relevant engineer). The operative goal of ComputerCorp's networks is to codify their engineers' tacit knowledge in the form of documents that are useful for problem solving. The networks contain all the experts of one product group, they exchange best practices and learnings with regard to customers' most frequently asked questions and create documents providing solutions. Each network is also responsible for monitoring the documents of their product group, changing them if required by the customer support (shorter, more reader friendly etc.) and ensuring their actuality. The knowledge goal is the codification of valuable tacit knowledge in order to transfer and apply it to customer support.

The support process is a global process within ComputerCorp, therefore the experts and call centers are spread around the world. The networks mostly cooperate virtually and communicate through telephone conferences and e-collaboration tools. ComputerCorp's very decentralized and business process oriented structure is replicated in its decentralized knowledge-networking concept that is focused on only one

business process. Beside the common goals that have been formulated by ComputerCorp's management, the networks' structure, their tools or meeting frequency differ quite substantially. There is no common performance measurement for all the networks, but each network coordinator is responsible for the quality of his product group's documents in the data base. The networks are self-responsible for defining the tasks for each meeting, the working process etc., which correspond with the corporate culture and structure. The decentralized KM team also corresponds to this structure since it is based in the support area and, beside the team members' work as engineers, they are responsible for fostering the network and other knowledge initiatives that might support the business. The degree of penetration (very focused on the support process) and the number of networks (approximately 10 networks) are sufficient for ComputerCorp's customer support.

The Consumer Corp: How can we support knowledge sharing across product groups?

Consumer Corp is a large international consumer goods company with a revenue of more than 48 million US Dollar, 270,000 employees worldwide and more than 100 brands sold in 88 countries. After a merger, the company was restructured in product groups and regions that were more independent of the headquarters and responsible for their own revenue, causing a slight competitive environment between the regions. The downside of the successful reorganization was that the link between the regional units working on the same topics, and enriching one another by knowledge sharing, no longer existed. The company decided to close the structural gap with the implementation of knowledge networks as an organizational form with which to support knowledge sharing between the regions and product groups.

Although Consumer Corp has flatter hierarchies than Autocorp and, unlike ComputerCorp, no strong knowledge culture, its networking concept is not very formalized. The network concept's global *strategic goals* are to increase efficiency through the reduction of redundancies and to create synergies between as well as within the various independent business units and product groups. Basically the knowledge networks (called communities within Consumer Corp) try to connect experts within the same practice in order to support the sharing of implicit knowledge (as a *knowledge goal*). The structure of the single networks is less formalized, the *central KM team* has established a few procedures for setting up networks

across the company (not a focused, but a global approach), but there is no common operative goal that all the networks need to pursue, or explicitly described procedures, working model etc. The communities were initiated by the management, and their members are self-responsible for maintaining their networks and trying to create value for the company, the independent business unit and for themselves. It seems appropriate that a central KM team has been established to implement a global concept for the company as a whole, but the business units' strong focus on self-responsibility and freedom means that centrally fostered initiatives have trouble succeeding.

This might be the reason why the network concept, though global, only consists of 20 communities that are spread across the company's product groups and regions (high *degree of penetration*). Consumer Corp's management regards knowledge management as an important success factor for creating value, but the *less formalized* network concept, having no clear and uniform *operative goals*, makes this concept difficult to maintain, difficult to prove its success and difficult to return the investment made by active management support. Due to the mentioned power structure (the strong power of the business units where the money is made, and the weaker central power) the communities are less empowered as well. Each business unit will independently decide if it wants to spend time and money on supporting a community, or on reducing its own power by shifting important decisions, or the improvement of a process etc., to the networks. Subsequently, network members find it difficult to create value by applying the outcome of their community work within their home business units.

Self-evidently there is no uniform performance measurement system with which to monitor the networks or visualize their value to their management (only the communication of brief success stories is used to visualize some of the networks' success). The less formal network approach therefore replicated the *company's culture* of autonomy and self-responsibility for the various entities (including internal competition for resources) as well as their strong business focus, but the power structure resulting in this structure and culture causes difficulties for all centrally supported initiatives.

The CompConsult: How can we support our globally dispersed consultants with valuable required knowledge?

CompConsult is the second largest international IT company in the sample. For approximately ten years they have integrated a special knowledge management (KM) unit in their consulting group as part of the company's re-engineering project to support knowledge sharing between employees. As a knowledge-intensive company, knowledge management is at the core of their business. The idea of this KM unit has been to institutionalize and formalize knowledge management throughout the company, which includes taking practical steps to acquire, create, share, and transfer knowledge; using knowledge to continually develop and grow; and anticipating and adapting to changing conditions. This also drives the establishment of international knowledge networks as formal platforms of knowledge sharing on a global level, as well as the establishment of local knowledge networks and communities of practice in the various regions.

The *strategic goal* of the fourth case company, CompConsult, is to increase the efficiency and quality of their consultancy unit through the creation of a common and high quality data base that would include all the necessary or available knowledge on CompConsult's products, best practices and lessons learned (codified in templates, project descriptions etc.). Contrary to Consumer Corp, this strategic goal is clearly translated into *operative goals* for the single networks: they would connect the key experts of each product and create a data base that would be available for all consultants around the world (and selected premium customers) via the intranet. The networks therefore largely function virtually because the experts are widely dispersed and capture all available knowledge, restructure or renew it and distribute it through the data base (in keeping with the *knowledge goal* of creating new explicit knowledge by restructuring existing explicit knowledge or codifying experts' tacit knowledge).

These knowledge networks furthermore replicate the strong corporate business focus by supporting the consultancies by means of valuable documents. Another goal of the network concept also included the sharing of tacit knowledge between network members (key experts) and the consultancies by means of electronic discussion groups. However, due to the great number of e-mail answers, documents to renew or to integrate into the data bases etc. this part of the concept wasn't a great success. To acknowledge the

competition for customer hours between the consultancies and the special justification structure (every hour not spent with customers is seen as negative and lost), which would normally be counterproductive for this knowledge management initiative, membership of a network has been established as one of the most important career steps with which to further one's career, or to achieve a partnership through excellence in the field. Only the very best and well-known experts can apply for core membership of one of the networks. Experts who are not well known have no way of exchanging implicit knowledge with these experts by means of personal communication or of getting an answer to a question not yet codified and available on the data base.

This unfulfilled need is satisfied through the emergent local networking concepts. To connect local consultancies and facilitate tacit knowledge sharing, most of CompConsult's bigger regional units have replicated the global networking system into local copies. These local networks, called knowledge centers, are comparable to the Consumer Corp communities that focus on tacit knowledge sharing, have a high degree of freedom and self-responsibility, are less formalized and therefore without explicitly stated and uniform operative goals. The idea behind this part of CompConsult's networking concept aimed to smooth the exchange of local tacit knowledge through personal, local meetings. It was thought that this would compensate for the lack of tacit knowledge exchange in the global concept, but the approach used for the local networks, which differs from the global one, didn't take CompConsult's business-oriented culture into account and doesn't include incentives for those who work in the local knowledge networks (no career incentive).

While the global networks do have very clear performance indicators related to the clearly formulated operative goals, the local networks lack these. These performance indicators are e.g., the number of documents in the data base, the number of documents extracted from the data base and used in projects, the number of applications for the creation of new documents answered etc. The global networks are supported by a central KM team in CompConsult's consultancy unit. The team members have a close relationship with the business units and therefore have the support of their peers. They establish new networks and maintain the existing ones by means of tools, courses, meetings, the definition of roles and

responsibilities, monitoring the performance of each network and visualizing the networks' success for the management. The very formal global network system is complemented by the less formalized, less empowered and locally supported knowledge centers (local KM representatives support the local networks).

A summary of the differences between the concepts

The following section summarizes the characteristics identified through within-case which led in the next section to the formulation and testing of hypotheses for knowledge networking concepts.

The following tables summarize the differences between the four network concepts in respect of the identified characteristics.

Table 3: Differences according in respect of the goals and the focus of the concepts

Company	Strategic Goals	Operative Goals	Knowledge Goals	Knowledge Network Concept
Autocorp	Increasing efficiency and minimizing risk in car development	Creation of a common knowledge base for the whole car development	Codifying tacit engineers' knowledge into explicit public knowledge (standards, best practices and lessons learned)	Widespread in all parts of the car development, very formalized
ComputerCorp	Increasing efficiency and minimizing risk in telephone support	Creation of a common and high quality support-data base to enable customers self help	Codifying tacit engineers' knowledge into explicit public knowledge (support documents)	Focused on the global support area, less formalized
Consumer Corp	Increasing efficiency through reduction of redundancies and creating of synergies between the independent product groups within the whole company	Different for each community, no uniform operative goals	Exchange of tacit knowledge	Global concept throughout all parts of the company, less formalized
CompConsult	Increasing efficiency in customer support	a) Creation of a common data base for the consultancies b) Different for each knowledge center, no uniform operative goals	a) Capturing and restructuring of existing explicit knowledge and codifying tacit experts' knowledge b) Exchange of tacit knowledge	Global concept plus local copies, globally very formalized, locally less formalized

The next table summarizes the differences according to the individual networks, the penetration of the concept, the locus of the KM team and the differences in the companies' structure and culture.

Table 4: Differences according to the size and penetration of the concept, the locus of the KM-Team and companies' structure and culture

Company	Number of networks	Penetration	KM-Team	Company's culture	Company's structure
Autocorp	ca. 100	Car Development Department	Central in car development	Bureaucratic and hierarchic	Hierarchic and centralist
ComputerCorp	ca. 10	Customer Support area	De-central in customer support area	Informal and knowledge friendly	Business oriented and de-centralized
Consumer Corp	ca. 20	Whole company	Central team	High degree of freedom and self-responsibility	De-centralized
CompConsult	ca. 60 (global) +40 (local)	Whole company	Central team in consulting area	Competitive-driven	Hierarchic and centralist

To summarize, the within-case analysis has already identified several elements (new constructs) that characterize the knowledge-networking concept of each company. These elements are

- The *strategic goals* of the company that the concept should support
- The *operative goals* that translate the company's strategy to the single networks
- The *knowledge goals* as a knowledge perspective translation of the strategic goals to the single networks
- The *company's culture* that provides a general elucidation of the company's handling of knowledge
- The *company's structure* that explains the adaptation of the concepts and how they differ in structure from the company's structure
- The *position of the knowledge management team* that enables or hinders the implementation and maintenance of the network concept
- The *number of networks, their structure and their penetration* within the organization

These first findings from the within case analysis didn't allow to identify the relationship between these elements. This relationship between the core elements are crucial to analyze how the networks are managed and which differences between the four companies exist. Without identifying these its will not be possible to create a model describing how systems of networks can be managed in corporate environment.

The following figure tries to illustrate the findings from the within case analysis at this stage of research.

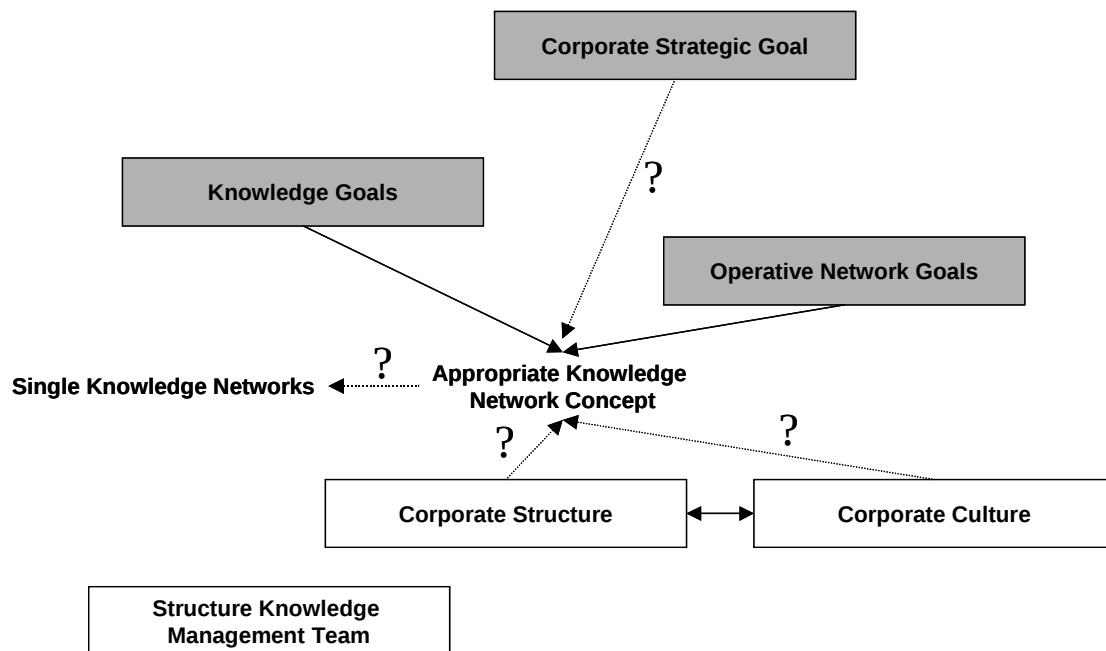


Figure 1: First results from the within-case-analysis: core elements/components of networking concepts

In the following third step a comparative analysis is made with propositions formulated to identify the relationship between the core elements. These propositions are tested along the collected data and led - if supported - to hypotheses which formulate how knowledge networks are managed successfully. “Overall, shaping hypotheses in theory-building research involves measuring constructs and verifying relationship.” (Eisenhardt, 1989, p. 543).

THIRD STEP: COMPARATIVE CASE STUDY ALONG PROPOSITIONS TO CREATE A GENERAL REFERENCE FOR KNOWLEDGE-NETWORKING CONCEPTS

In this section I will discuss the above-illustrated differences between the various case studies according to the propositions created to analyze the relationship between the core elements of all knowledge networking concepts. The aim is to deduce the general factors at the core of all networking concepts and to formulate hypotheses describing the established relations.

What determines the success of a concept?

The *knowledge-based theory of the firm* describes the impact of knowledge and knowledge management in creating a firm's competitive advantage (e.g., Grant, 1996; Grant & Almeida, 1997; Spender, 1996a, 1996b). Knowledge management activities, and therefore knowledge-networking concepts, aim to support a company's strategic goals in order to create competitive advantage. Consequently, the success of those concepts can be measured by achieving the proposed goals. Von Krogh et al. (2001, p. 19 f.) point out that goals such as minimizing risks, increasing efficiency and improving innovation are likely to be supported by knowledge activities. By translating this into knowledge-networking concepts, one can formulate the following proposition:

Proposition 1.1: *Knowledge-networking concepts need to support the company's strategic goals in order to create maximum value.*

On analyzing the gathered data, it seems evident that all knowledge-networking concepts try to support the strategic goals that the companies' management has set and that the KM team known well. When comparing the selected strategic goals with the various networking concepts (see Table 3), it becomes clear that several elements of the concepts have been shaped to achieve the companies' strategic goals, but more detailed propositions need to be formulated and tested to analyze how a network concept can be specifically shaped to support a strategic goal.

Institution economy approach (e.g. Davis et al., 1971; Williamson, 1975; Jensen & Meckling, 1976, p. 308) argues that the shape of an environment strongly influences single actors' action. The exchange of knowledge within knowledge networks occurs if the cost of this organizational form is less than that of other forms with a comparable outcome, the value for the company through efficient support of the strategic goals is sufficient, and this exchange is valuable for the various actors themselves. Taking a knowledge-networking perspective: to support the company's strategic goals, and thus create value, the strategic goals need to be translated into operative and knowledge goals for the single networks of the concepts in order to operationalize them. Only the transformation of knowledge from tacit, individual knowledge into explicit, collective knowledge creates sustained competitive advantage (Nonaka, 1991). This transformation process needs a supportive environment (Nonaka calls it "ba", see Nonaka et al.,

1998) which helps to transform the knowledge and transfer it to the place where it is most needed. Also *exchange theory* demands that the environment needs to be designed in a certain way because effective knowledge exchange can only take place if the process is embedded in a context and is part of a longer social relationship between the entities (Cook & Emerson, 1984; Cook, 1977, p. 64-65). To summarize the discussed theories, the network concept needs to be shaped to create a supportive environment for transformation and interaction processes in order to fulfil the selected strategic goal, or vice versa: the company's strategic goal defines the appropriate environment that needs to be created by the networking concept. This leads to the formulation of the next proposition:

Proposition 1.2: *The company's strategic goal defines the shape of the networking concept.*

This proposition is only partly supported by the gathered data. All the investigated companies stated, more or less explicitly, that increasing efficiency was a main strategic goal that had to be reached via different operative goals. However, the concepts on how to achieve these differ substantially. Illustrated in Table 3, the concepts are adapted in their structure to match the strategic goal as well as the operative goals derived from it. Global goals, like Consumer Corp and CompConsult's goals for their global networks, are matched by global concepts that networks disperse across the company, whereas local goals are represented by concepts focused on one part of the organization. For example, Computer Corp's focus on the support process, and Autocorp's focus on the car development division. But, the shape of the concept is not only defined by the strategic goals, otherwise concepts with the same strategic goal and the same focus would be more alike. This proposition is supported by the data gathered as well as by the *interaction theory*. The shape of the concepts still differs, for example, in respect of the number of networks, degree of formalization or empowerment of the single networks. Factors other than strategic goals therefore shape the concepts.

When combining the demands of the *knowledge-based theory of the firm* (Grant, 1996; Grant & Almeida, 1997; Spender, 1996a, 1996b) with *transaction cost theory* (e.g., Coase, 1991 und Williamson, 1989), it becomes clear that knowledge networks and their concepts will be implemented if the cost of reaching the same outcomes (supporting the strategic goals) is less than that of other organizational functions or

processes within or outside the company that could provide similar results. The gathered data can't prove that the concepts are the cheapest or most effective way, because the data gathered focussed on the implemented concepts rather than on other organizational functions or processes aimed at the same strategy support. But the mentioned theories point out the variables that need to be analyzed to prove the success or failure of the networking concepts: attaining the strategic goals set for the concept.

Proposition 1.3: *The success of the knowledge network concept can be measured by reaching the proposed strategic goal.*

The shape of the concept, as mentioned before, can positively or negatively influence the attaining of the strategic goal because an interaction between the network members and the transformation of knowledge is needed to reach the proposed goals. But what defines the success of a concept? A concept can be regarded as successful through outcome measures that prove the impact of the concept on the strategic goal. If it is not possible to isolate the impacts of the concept from other activities supporting efficiency, one can measure the achievement of the operative goals as derived from the strategic goals, but operationalized more. Since the former is extremely hard to achieve because companies do not have an efficient performance measurement, the latter will be used as variable to identify success or failure. If the operative goals as well as the knowledge goals are clearly derived from the strategic goal and the single networks achieve their goals, the concept can be regarded as successful (see proposition 3.1). To support the single networks to reach their goals, their shape needs to be adequate. Which leads to the question of what shapes concepts and single networks?

Which factors shape the knowledge network concept?

What it is that shapes a knowledge network concept can be explained by the introduced analysis framework as well as through the identification of the core differences in the previous section of this article. But the description of these elements and characteristics can not explain the relationship and quality necessary to create a successful knowledge-networking concept because all four concepts differ substantially. Therefore the next cluster of propositions tries to define links between the different core elements in order to formulate general hypotheses that could guide other companies as well.

When examining strategic goals and wishing to adapt the shape of concepts according to the goals they propose to attain, it is necessary to take a look at how global or local the goals set for the network concept are. Three propositions can formulate the possible relations of single elements towards the global or local focus of the goal. First, the number of networks within the concept and the penetration of these networks throughout the company can be related and thus shape a concept and enable the fulfilling of the goals. Local goals are likely to be supported by local network concepts with a large or small number of networks depending on the number of people who need to be connected through knowledge networks. The number of networks and their penetration throughout the company are evidently not as such related to success or failure. A small number of networks with a narrowly focused local strategic goal and therefore a low degree of penetration can be very successful in reaching its goal. But it is also likely that a concept with a global goal, but a very small number of networks not connecting all the relevant people, or with a low degree of penetration can be seen as unsuccessful because it can't attain its proposed global goal.

Proposition 2.1: *The degree of penetration and the concept's number of networks need to be adequate to fulfil the strategic goal.*

If the strategic goal is focused on one business unit or process, such as Autocorp and ComputerCorp's concepts, the network concept is also focused by means of the locus of the networks within the company. The penetration of the networks is high (widespread throughout the company) if the concept supports a global goal, as seen in Consumer Corp's concept and CompConsult's global networks. The number of networks should reflect the approach, global approaches should possess a large number of networks to connect all owners of related valuable knowledge in the company, whereas local concepts might need fewer networks to connect their experts. The data display a different picture as summarized in the following figure.

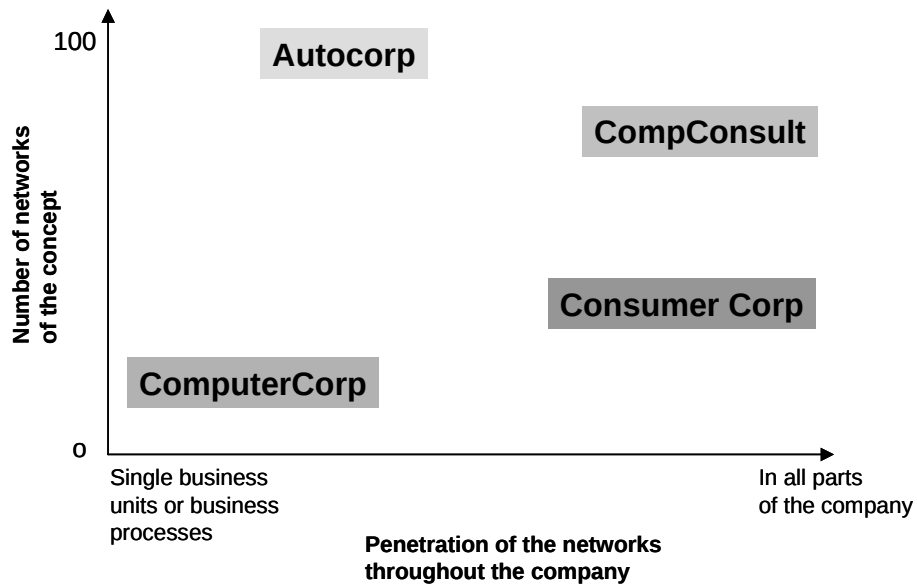


Figure 2: Penetration and number of networks

As seen in the figure above, the number of networks can't fully indicate the globalization or local focus of the networking concepts. While the number of networks is large in Autocorp and CompConsult, the former is a local concept in a large department and the latter is a global concept. The same ambiguous result is found with the concepts that include a small number of networks, one of them represents a global concept (Consumer Corp) the other a locally focused concept (ComputerCorp). Consequently, the number of networks alone can't indicate the focus of the concept and cannot in itself be responsible for shaping the concept, other factors need to be taken into account.

Closely related to this point is the element regarding the centrality of the concept. As mentioned before, the globality or locality of the strategic goals needs to be matched by the shape of the concept. No local concept is likely to reach global goals or vice versa.

Proposition 2.2: *The globality and centrality of the concept are influenced by its strategic goal.*

The analyzed data support this proposition. The number of networks seems not to be indicative for success or failure. A large number of networks is not evidently linked to success, nor vice versa. The number of networks too can't be indicative of the focus of the concept, but should be appropriate to attain the proposed goals. That means the number of networks should be adequate to connect all necessary

experts. In pointing this out, it does seem that ConsumerCorp's small number of global networks can't meet this requirement.

The above-mentioned propositions can be summarized in the following two hypotheses:

Hypotheses 1: *The strategic goal of the networking concept defines the degree of penetration and the number of required networks. A local strategic goal can be attained with a low, but focused, penetration of the concept, although the penetration should be throughout the company for global strategic goals. If the networks pursue a global or local strategic goal, they need to connect the appropriate experts for the focused field or throughout the company. Therefore, the number of networks needs to be appropriate.*

Hypotheses 2: *The number of networks and the degree of penetration alone can't be indicative of the success or failure of a concept, because both need to be adapted in accordance with the strategic goals chosen. If the number of networks or their penetration is not appropriate, this could impede the reaching of the strategic goal and therefore the success of the concept.*

When examining the implementation and maintenance of a global or local networking concept, one needs to take the position of the knowledge management team into account. Each project or process needs a strong and able driver who is empowered to manage what needs to be managed to fulfil the set tasks. The empowerment needs to be sufficient to enable the person or group to do what is necessary. Speaking from a knowledge network perspective, the knowledge management (KM) team needs to be empowered to set up and maintain the concept. When examining the meaning of empowerment, it is necessary to point out the differences between companies' KM teams. Not all companies possess global KM teams with which to support all global KM activities. Decentralized companies, whose various business units or product groups have a high degree of self-responsibility and freedom, tend to have local KM representative, because they know the business needs better than the central departments might. Although it can't be generally said that a local KM team is more or less successful than a centralized KM department, one could argue that the limited power of local teams make them less appropriate for fostering global initiatives. One could therefore argue that the centrality or de-centrality of and the empowerment related to this structure influence the success and the selection of strategic goals.

Proposition 2.3: *The centrality or de-centrality of the knowledge management team influences the choice of strategic goal (local or global).*

The investigated networking concepts contain both centralized as well as de-centralized KM teams with which to support and foster the concept. Is a central KM team a precondition for establishing and maintaining a global concept? Does the company's departmental structure in respect of the KM department limit its ability to implement global concepts and therefore pursue global goals? Is a decentralized KM team a necessary precondition for implementing successful business-oriented local concepts? The answer to these questions is indicated by the uniform picture presented by the case studies: the global concepts of Consumer Corp and CompConsult do have a global KM team for support, the more locally focused concepts of Autocorp and ComputerCorp do have de-centralized KM teams based in the business units or processes where the concepts are located. The following table shortly summarizes the link between the concept and the KM team.

The data illustrate that the global team seems to be appropriate, because it is empowered to implement a global process or a global organizational structure such as a knowledge-networking concept. The power and responsibilities of a central KM team helped to find the appropriate support in the business units to implement the networks for the sake of the company as a whole. The decentralized team with its advantage of a strong business relation with and anchorage in the business unit where the concept was launched, helped to get the acceptance of the employees and the appropriate management support to implement local networking concepts. Both locations of the KM teams therefore have their advantages, but their position also limit the range of the concept that can be implemented. The data are unable to prove that the focus of the goals (global or local) was chosen by the management because of the corporate KM team structure. It does, however, seem likely that this was one reason for the decision.

The ways of supporting the networking approaches are quite different. On the one hand there might be a link to the degree of the concept's formalization that might depend on the company's corporate culture, while, on the other hand, the individual way of supporting the concept might be more related to the resources of the KM team itself. On examining the data, ComputerCorp does have an open and less formalized support of the single networks. The high degree of self-responsibility and the experienced

value of knowledge sharing throughout the company make formalized support less necessary. It seems to be sufficient to offer tools such as common data bases, websites and a group-mailbox to ease the networks' work. The groups are empowered to define their own working processes as well as their responsibilities and measures. A more formalized approach would predefine all those tasks and reduce the individual empowerment, which would not match the corporate culture.

Comparing this less-formal approach with the multiple tools and help that Autocorp offers its networks in setting up and maintaining the network concept, this support can be explained by means of its more formal concept. Autocorp wishes to define everything from a central point of view, which can be translated into the creation of multiple tools, process descriptions, role definitions and clear responsibilities for everybody involved. Similarities can be seen with the CompConsult case with its very formalized approach as well. The high degree of formalization within CompConsult's global networks might be caused by the very structured and formalized consultancy culture in which the concept is embedded. Metrics measure the value of individual action exactly to maintain the "up or out" structure with which consultancies have to live. This structure has been replicated in their global networking system.

The support of Consumer Corp's less formalized concept as well as CompConsult's less formalized local knowledge centers is more oriented towards the set up rather than towards the maintenance of the networks that empowers their members to define their own processes and find a working mode which fits their individual goals. This less formalized approach can be specifically chosen to match the company's culture or by having fewer resources to maintain the support after the set up. To clarify this it is necessary to discuss the influence of the corporate culture and structure on the networking concepts (see proposition 2.4).

At this stage it can be said that the data support the proposition that the mode of the support that the KM team offers should be adequate in respect of the concept's degree of formalization. Formal concepts include multiple tools, process descriptions, working mode definitions, clear roles and responsibilities as well as indicators with which to monitor the networks' action. Less formal concepts only include the

crucial tool with which to unify the networks and link them to a common concept, while also empowering the groups to define their own best way of working together and achieving results. The data don't provide evidence pertaining to the influence of resource constraints on the formalization of the networks' support. The data do, however, indicate that central KM teams are likely to implement global concepts, whereas decentralized KM teams implement local networking concepts. The degree of formalization might depend on the company's culture, which needs to be validated by a new tested proposition.

The centrality or de-centrality of the KM team depends on the company structure as well as on the corporate culture. As the *institutional economic theory* points out, the company context strongly influences the organizational forms as well as the behavior of individuals within the company. Adapting this to knowledge network concepts, it seems obvious to argue that the shape of the concept will be strongly influenced by its surrounding, meaning the organizational structure and culture.

Proposition 2.4: *The shape of the concept is influenced by its surrounding, i.e. the organizational structure and culture.*

When examining the interrelationship between the network concept and the corporate culture and structure, one becomes aware of the adaptation of the concepts in respect of the different institutional environments. On the one hand, Autocorp and CompConsult's global knowledge center chose very formalized concepts that match their hierarchical and formalized corporate culture as well as their central-orientated organizational structure. CompConsult's competitive-oriented consulting culture is matched by the strong career incentive bound to participation in a knowledge network. Autocorp's bureaucratic and hierarchical culture is replicated in a networking concept with a detailed management and controlling system that itself reflects the hierarchies through its hierarchically clustered networks with their different roles and responsibilities that control one another in order to achieve the proposed goals.

ComputerCorp and Consumer Corp have decentralized organizational structures with empowered business units or product groups. Their culture is characterized by a high business orientation as well as a high degree of freedom and self-responsibility for the entities. Their less formalized, and therefore empowered, networks match their corporate structure and culture. Only CompConsult's local knowledge centers don't fit this picture: their low degree of formalization and high degree of freedom (by defining

their own operative goals, processes, working modes, responsibilities, frequency of communication etc.) don't fit the formalized corporate culture.

This might be the reason for the difficulties that these networks are facing at the moment. The data therefore undoubtedly support the proposition that the concepts try to match the corporate culture and structure, and that the degree of fit might be a key success factor for the networking concept. The following table summarizes the link between the corporate culture and structure and the networking concepts chosen.

In the light of the data analysis, it can be stated that the concept's shape is influenced by the chosen strategic goal (which is influenced by the locus of the KM team) and that it tries to match the corporate structure and culture to ease acceptance and to work successfully. This can be summarized by the following three hypotheses:

Hypotheses 3: *Global strategic goals for knowledge-networking concepts can be better addressed by central KM teams since locally focused goals can be better addressed by decentralized KM teams. The support (selection and offering of tools, templates, process definitions etc.) is dependent on the corporate culture in respect of the KM team's resources.*

Hypotheses 4: *The knowledge-networking concept needs to be adapted in respect of the corporate culture in which it will exist and act, in order to ease acceptance and ensure a valuable outcome that can be implemented into the company immediately. The concept's degree of fit in respect of the corporate culture and structure enables experts to interact as well as to transfer and create knowledge. A bureaucratic and hierarchical organizational environment needs to be addressed through a formalized concept, while a decentralized structure with empowered entities needs to be matched with a less formalized concept.*

Hypotheses 5: *The corporate structure also needs to be addressed by the shape of the networking concept. A corporate structure that is either business- or competition-oriented, centralized or de-centralized, hierarchical or flat and flexible, needs to be mirrored in the structure of the networking concept as well.*

On taking a micro-perspective of the concept, the design of the single networks becomes an important factor to fulfil the concept's goals. As mentioned briefly before, theory demands purposeful design of

knowledge networks and their concepts to support interaction of the network members for the good of effective and efficient knowledge transfer and creation .

Strategic goals are too abstract to structure such an exchange of knowledge therefore they need to be translated into operative and knowledge goals for single networks. Only this operationalization of the strategic goals allows adequate support of the task through networks' action. This means that for single networks a goal such as, e.g., increasing the efficiency and quality of the customer support needs to be translated into operative and knowledge goals which can then be translated into tasks to make them manageable. An appropriate network's operative goal could be the creation of a common high quality data base which capture all valuable data for customer support. The knowledge goal might be the transformation of the engineers' tacit knowledge into public, explicit knowledge that is captured in this data base. The network needs to be shaped to support the reaching of these goals, or vice versa: networks with different goals will be shaped differently in order to support these goals efficiently.

Previous research (von Krogh et al., 2004) has pointed out that all knowledge networks contain the same core components. Differences can be seen in the quality of these components, such as the degree of management support, or the frequency and style of communication. Consequently, two propositions can be formulated to capture this discussion:

Proposition 3.1: *The concept's strategic goal defines the operative and knowledge goals of the concept's single networks.*

Proposition 3.2: *The shape of the single networks, meaning the quality of their components, needs to be adapted according to their operative and knowledge goals.*

On examining the linkage between the strategic goals and the derived operative and knowledge goals it becomes clear that Consumer Corp and the local networks of CompConsult do not have clearly defined operative goals. The concept's networks define their own operative goals, which makes a common performance monitoring difficult. Autocorp and ComputerCorp's networks (as well as the global networks of CompConsult) do have clearly defined operative and knowledge goals derived from the strategic goals that all the concept's networks pursue.

Clustering these cases into two group in respect of their knowledge goals, some common characteristics become clear: while ComputerCorp and CompConsult's local networks define the sharing of tacit knowledge as their goal, Autocorp and ComputerCorp's networks (as well as the global networks of CompConsult) consider the codification of tacit knowledge as their main goals. The table below summarizes the link between the different goals.

If justifying the investigated concepts in respect of the fulfillment of their operative goals, with a direct link to the selected strategic goals, one can easily point out which of the investigated concepts are a success and which not. Autocorp and ComputerCorp, as well as the global networks of CompConsult, measure their performance in respect of the reaching of their operative goals by the number of documents, process descriptions and templates the network member create. The management of these three companies describes the networks' performance as sufficient. Observing the close link between these operative goals and their strategic goals, the networking concepts can be regarded as successful because they do have an impact on the strategic goals of the companies. Consumer Corp and CompConsult's concepts do not have clearly defined operative goals derived from their strategic goal, which makes it hard to justify the successful or not of the concepts.

Nevertheless, the data allow us to maintain that the lack of clearly defined operative goals is related to the difficulties of establishing a common performance monitor within these companies. The strategic goal of increasing efficiency and the knowledge goal of sharing tacit knowledge are not operationalized enough to measure success or failure. Due to the absence of performance measurement data, the concepts of Consumer Corp and CompConsult can not be described as either successful or unsuccessful. It is not possible to prove an impact on the strategic goals of these two companies. But the small number of networks within Consumer Corp's global concept and the decreasing number of local networks in CompConsult's concept within the last year indicate the presence of problems. Two hypotheses formulate this interlinkage:

Hypotheses 6: *The strategic goals of the knowledge network concept need to be translated into appropriate operative and knowledge goals to operationalize the*

strategic goal for the individual networks. Therefore, the operative and knowledge goals link the networks' action with the company's strategy.

In respect of the performance measurement and success of the concept, the second hypothesis is important:

Hypotheses 7: *Only if there is a close link between the strategic goal of the knowledge network concept and the operative and knowledge goals of the single networks, can the networks' performance illustrate the impact of the concept on the company's strategic goals.*

The question remains whether the single knowledge networks' structure is more influenced by the corporate culture than by their operative and knowledge goals. If the first is true, all networks across the companies need to be different, while the second can be verified by clustering all the networks of the four companies according to their comparable operative and knowledge goals. Or, if both is true the network's shape is influenced by its goals as well as by its surrounding environment. This proposition is supported by the results of the question "How to manage knowledge networks?" discussed above. The whole networking concept of shaped according to its goals as well as according to the company's corporate culture and structure. It is likely to find the same result on a micro level of the single knowledge networks. Consequently, the proposition formulating this topic is:

Proposition 3.2: *The components that shape a knowledge network needs to be adapted according to the network's operative and knowledge goals as well as according to the corporate culture.*

By comparing the data of the single case studies in respect of the set up of the single knowledge networks in the different concepts, it becomes clear that all knowledge networks are shaped by the same core components. The differences lie in the quality of the components. All networks are *supported by the top management*, follow explicitly stated goals, have *motivating factors* that support knowledge sharing between their members and therefore, support the building of *relationships* between them. All networks try, more or less successfully, to monitor their performance in order to illustrate their value for the management. The network processes are supported by *organizational and technological tools* like frequent meetings, data bases and common mail-boxes etc. The single case study data verify that all these

component can be found in all the knowledge networks of the four investigated companies, but that their quality differs substantially per company. There could be, for example, a very detailed and clear system of roles and responsibilities implemented in one company and only very few (the crucial) and broadly described roles within another. The question remains whether the quality of the core components differs in respect of their goals to attain, or in respect of the corporate culture in which they work. The following table describes the differences between the quality of the core components' tools, roles and responsibilities and communication in the different case studies in order to identify similarities or relations with the concepts' goals.

Table 5: Relation between the goals of the network and the quality of its core components

Company	Strategic Goals	Operative Goals	Tools used	Roles and responsibilities	Communication
Autocorp	Increasing efficiency and minimizing risk in car development	Creation of a common knowledge base for the whole car development	Knowledge data base available via Intranet, multiple tools to support the network processes like courses, templates pre-defined processes etc.	Strongly structured role-definitions, very formal determination of responsibilities	Frequent personal meetings
Computer Corp	Increasing efficiency and minimizing risk in telephone support	Creation of a common and high quality support-data base to enable customers self help	InterView-data base with common mailbox, less structure set up and no network specific additional tools	Broad role definition exists, but single networks can adapt these according to their special requirements	Frequent personal or virtual meetings (depend on location of the team members)
Consumer Corp	Increasing efficiency through reduction of redundancies and creating of synergies between the independent product groups within the whole company	Different for each community, no uniform operative goals	Strongly formalized process till the kick off of a network to enable network members to define their own processes and tasks, only few support in the maintenance phase of the network	Broad role and responsibilities definitions exists, networks need to define their own roles on that basis	Frequent personal meetings
Comp Consult	Increasing efficiency in customer support	a) Creation of a common data base for the consultancies b) Different for each knowledge center, no uniform operative goals	a) Data base to collect explicit knowledge, very formalizes and with multiple tools supported set up and maintenance of the global networks. b) More freedom in defining there own processes, no special networks tools	a) Strongly structures role definition (many roles), formal determination of responsibilities b) Description of roles and responsibilities are seen as offer to structure the work	a) Frequent virtual meetings b) Less frequent personal meetings

As summarized in the table above in respect of the analysis of the detailed case studies, it becomes clear that the structure of the knowledge networks (meaning the quality of the core components and the network support) has been greatly adapted in keeping with the goals of the network. The frequency and kind of communication (personal or virtual meetings) as well as the pre-defined roles, responsibilities and processes aim to support the operative and knowledge goal of the networks.

Therefore, network concepts aiming at tacit knowledge sharing (like the concepts of Consumer Corp and the local networks of CompConsult) do support personal meetings, do use tools like flipcharts and focus their roles more on organizing these meetings and capturing the results. Network concepts aiming at the codification of tacit knowledge and the restructuring of explicit knowledge are supported by data bases, common mail boxes, dedicated roles and responsibilities to smooth virtual cooperation as well and to support the development of a high quality data base. But it also becomes clear that the degree of formalization and the selection of tools within the concepts are more related to the corporate culture than only to the proposed aim. On comparing the concepts with comparable goals, one still finds that there are differences in the degree of formalization regarding how detailed a role description is, or how empowered the groups are to define their own structure.

In summary, one can say that the data of the investigated knowledge networks support the proposition that all networks are shaped by the same core components, but that their quality differs substantially in respect of, on the one hand, the networks' operative and knowledge goals and, on the other hand, the corporate culture. Three hypotheses are formulated to cover these results:

Hypotheses 8: *All knowledge networks contain the same core components, but differ in respect of their quality. The quality of the core components needs to be adapted to support the fulfillment of the operative and knowledge aims as well as having to be adapted to the corporate culture in which it works.*

Hypotheses 9: *To fulfill the proposed strategic goal it is necessary to translate it into clearly defined operative and knowledge goals in order to shape the networks according to these goals.*

Hypotheses 10: *The success of a knowledge network concept can be measured by the fulfillment of the operative goals if there is a close link between the concept's strategic goal and the networks' operative goals .*

CONCLUSION

Results and their implications

I began this paper with the question: **How to manage knowledge networks?** This researched was designed in a three step approach where the first step analyzed theory from different research streams in order to create a framework (called analyzing frame) suitable to collect all data needed for analyzing systems of knowledge networks in companies. The second step was to collect data with the analyzing frame within four major companies using networks and conduct four within-case-analysis in order to deduce the core elements for networking concepts. In a third step build the comparative case study made by formulating and testing propositions to identify the relationship between the core elements identified. Verified propositions were formulated into hypotheses to build a general reference how knowledge networks are managed successfully. This approach is taken and adapted from Eisenhardt (1989) recommended for theory building research.

Summarizing the results of this comparative case study and the major implications for practice, the validated proposition results in the formulated hypotheses to develop a general reference for knowledge-networking concepts in practice. The hypotheses describe the shape of a knowledge-networking concept and its single networks as well as its strong linkage to the corporate structure and culture. The findings also describe how knowledge networks support strategic goals by translating them into operative and knowledge goals for each single network of the concepts. The close link between these goals enables the difficult performance measurement of the networking concepts and help to illustrate their impact on the corporate strategic goal. The close link between the goals can therefore be regarded as one of the crucial success factors. Other success factors are the adaptation of the network concept's shape in respect of the proposed strategic goal (number and shape of the single networks, degree of penetration) and the corporate structure (e.g., de-centralized or centralized, hierarchical or with flat hierarchies) and culture (e.g., high degree of self-responsibility and the groups' degree of empowerment). The company structure as well in the locus of the KM team can be regarded as limitations in choosing a networking concept for a company. The following figure summarizes these findings by illustrating the influence factors and limitations which need to be taken into account for shaping a knowledge networking concept.

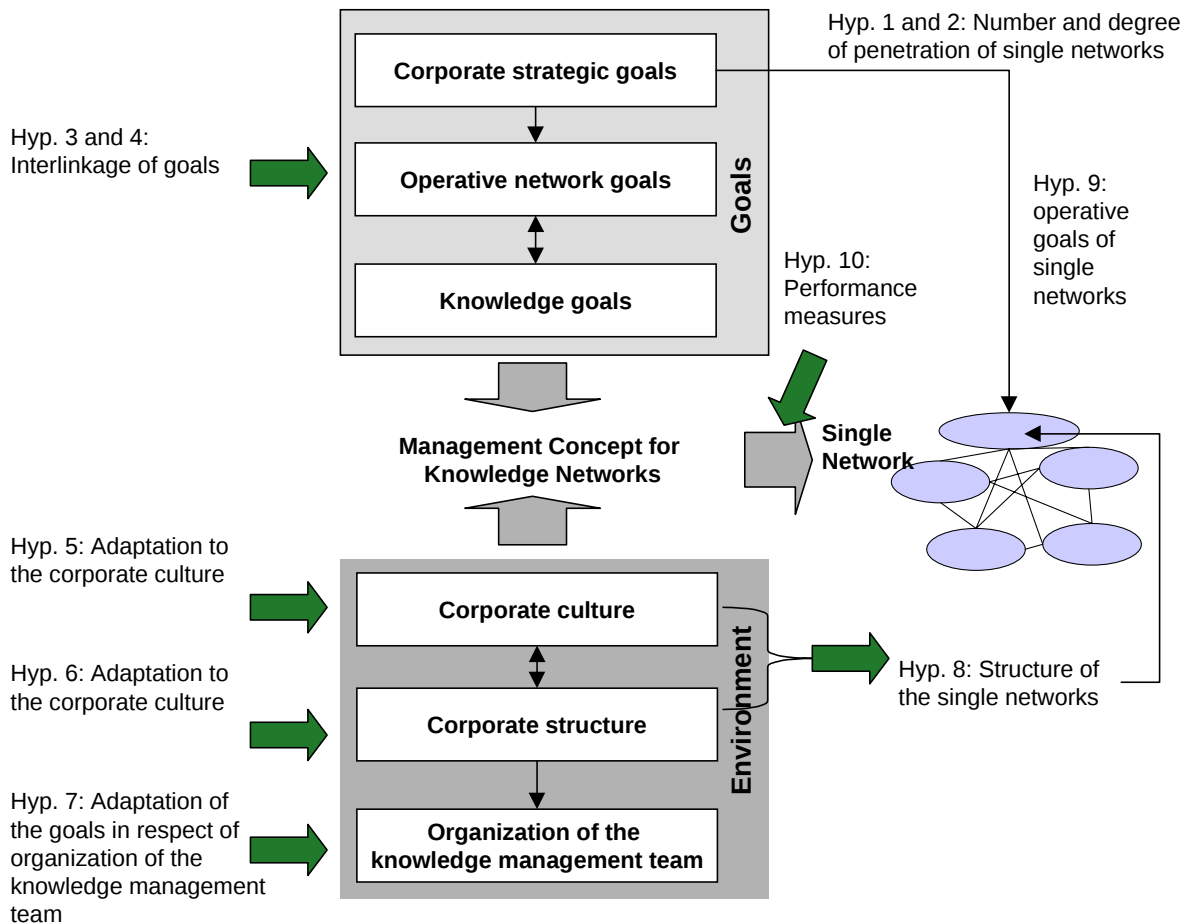


Figure 3: Reference model of core components to manage knowledge with networks

These findings have a major impact on management that want to support strategic goals such as increasing efficiency. Following the results gained from this study knowledge networking approaches provides the link between strategic goals and knowledge management activities because the concepts translate strategic goals into operative goals for the single networks to follow. They provide a substitute micro-environment in which the experts can share their knowledge and provide value for the company and themselves. The results clarify for the first time (like illustrated in the figure above) how the different goals and the company's environment are related to each other and therefore shape the knowledge network concept.

Limitations and Future Research

Several limitations to be found in my study offer opportunities for future research. First, this study is limited in its results because it only examines four case studies describing four different networking

concepts. This limited data base is a major drawback, but is sufficient to develop hypotheses that need to be tested on a broader sample in further research efforts.

Second, all concepts are more or less explicitly focused on the strategic goal of increasing efficiency, none of the case studies illustrates a concept aiming at other goals. Nevertheless, literature indicates that knowledge management initiatives also support the improvement of innovation, or simply the reduction of risks (see e.g., von Krogh et al., 2001). A replicated study with concepts following other strategic goals should clarify if the above hypotheses can be validated in these contexts as well.

Third, no data are available to explain if the choice of a knowledge-networking approach is the appropriate approach in respect of costs and efficiency in fulfilling the selected strategic goal. Why do companies decide to go for knowledge networking instead of other knowledge management approaches? Did they experience failure with knowledge networking in other parts of the organization, or with other strategic goals? All the companies regard their examined networking approaches as successful, but this also limits the learning that can be drawn from analyzing the concepts. Further research should therefore deliberately search for failing networking concepts, preferably in the same companies as those used for the examined approaches, to identify the crucial factors when knowledge networking could be a valuable instrument for translating strategic goals and when to choose other instruments to attain the proposed goals.

REFERENCES

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