Knowledge Networks – an integrated approach to managing explicit and implicit knowledge

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Abstract

From Polanyi [1967] we know that it is not, for example, the exchange of documents, but the exchange of experiences and individual cognition that represents the highest value for a company. It was Polanyi who first mentioned the differences between implicit and explicit knowledge and the inherent varying value of implicit knowledge. But implicit knowledge is difficult to manage or externalise.

Within companies, knowledge management activities to manage and improve their organisational knowledge base are manifold, but most of them lead to the managing of explicit knowledge. One can differentiate between ICT oriented measures, e.g. the development and implementation of knowledge data bases, or knowledge portals which aim to manage mainly explicit knowledge such as documents or guidelines, and organisational activities such as the support of Communities of Practice or the forming of networks which aim to support the transfer and share of implicit knowledge.

If we can combine an organizational form like a Knowledge Network, which represents a device for the storage for and transfer of implicit knowledge with ICT tools like e.g. portal components as device for the storage for and transfer of explicit knowledge, we can create a powerful knowledge management instrument that will be able to manage both implicit and explicit knowledge. Both instruments can be combined to provide the foundation of a balanced knowledge management approach. The paper firstly describes briefly the limitations of the current knowledge management approaches and the potentials of ICT, especially portals and organizational forms like communities of practice for knowledge management. It subsequently proposes a compound approach to deliberately balance implicit and explicit knowledge management within the organization. It then introduces the

concept of knowledge networking as potential solution. The potential of utilizing Knowledge Networks co-opted with ICT is shown by discussing the reference model and its different levels. Finally, conclusions are drawn for the installation and management of augmented Knowledge Networks, and for further research efforts like customers' knowledge integration in this field.

"The most important aspect in the theory of knowledge-creating firm is the capability to continuously create new knowledge out of existing firm-specific capabilities, rather than the stock of knowledge such as particular technology that a firm possess at one point in time. [...] The activities, strategy, structure and culture of the firm are of major concern." [Nonaka et. al, Industrial and Corporate Change, March 2000, p.4].

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About the author

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Introduction

A glance at Teleos' ranking list [Teleos 2000], reveals something else of considerable importance, namely that no company today can afford to look for ways to make the best use of its knowledge. In view of the rampant change in the global markets, resulting in a completely new value being ascribes to knowledge and its intelligent networking, this in no surprise.

Knowledge can be seen as companies' most important resource, the leveraging of which should be supported [Drucker, 1990, 1993, 1994; Toffler, 1990; Quinn, 1992]. Nonaka and Takeuchi [Nonaka/Takeuchi 1995] mentioned that: "In an economy where the only certainty is uncertainty, the one sure source of lasting competitive advantage is knowledge." But how this leveraging can be brought about, is a question that both companies and the academic world are discussing. During the past few years there have been many initiatives as well as the development of instrument regarding the management of knowledge. A study by the Gartner Group has shown that most large companies have started to implement knowledge management schemes, or are in the process of developing them [Smalley-Bowen/Scannell 1999].

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Approaches in knowledge management

Knowledge management can – according to Probst and Romhardt [1997] - be define as an improvement of the organizational capabilities on all levels of the organisation through better handling of knowledge as a resource. Careful handling of the companies' knowledge through deliberate activities is done with the aim of assisting the knowledge processes locate and capture, transfer and share and the creation of new knowledge. Krogh, Ichijo & Nonaka point out that knowledge should not so much be the object of deliberate management processes than be the supporting of employees to empower them to manage their targeted knowledge [Krogh et al. 2000].

From Polanyi [1967] we know that it is not, for example, the exchange of documents, but the exchange of experiences and individual cognition that represents the highest value for a company. It was Polanyi who first mentioned the differences between implicit and explicit knowledge and the inherent varying value of implicit knowledge. But implicit knowledge is difficult to manage or externalise [Nonaka/Takeuchi 1995]. Within companies, knowledge management activities to manage and improve their organisational knowledge base are manifold, but most of them lead to the managing of explicit knowledge. One can differentiate e.g. on the one hand side between technical oriented knowledge management approaches which use measures, e.g. like the development and implementation of knowledge data bases, or knowledge portals [see e.g. Bach et al. 2000, Thiesse 2001] which aim to manage the access mainly to explicit organisational knowledge such as documents, yellow pages or guidelines. On the other hand side a more human oriented knowledge management approach which includes organisational activities such as the support of Communities of Practice [see Orr 1990; Brown/Duguid 1991 und Wenger 1998] or the forming of networks [see e.g. von Krogh et al. 2002] which aim to support the transfer and share of implicit knowledge. Both approaches, technical oriented and human oriented,

serve huge advantages in single fields but are seen as black or white solution and therefore, are mostly not combined to leverage a higher potential.

The distinction between implicit and explicit knowledge plays an important role in the knowledge management literature [Polanyi 1967; Nonaka 1991; Nonaka/Takeuchi 1995; von Krogh et al. 2000]. The articulated, or codified form of knowledge, is explicitly represented in physical or material objects. These can be patents, manuals or guidelines¹. The exchange of explicit knowledge involves people's own language or vocabulary, codified procedures, relevant documents and so on. Implicit knowledge is difficult to formulate, and therefore difficult to communicate to others [see Polanyi 1967; Nonaka/Takeuchi 1995]. In order to ride a bicycle, we need to know how to keep our balance. We do not think about whether we should steer to the left or right to avoid falling off and, if we were asked, we would be unable to articulate what exact knowledge is needed. This implicit knowledge is rooted in our everyday behaviour and is always connected to a specific context – a specific technology, a profession or a community. Our "know how" - the practical skills or expertise that allow us to work efficiently and effectively and not always have to think about detailed ways of solving a problem, but simply doing it - has its origin in our implicit knowledge [Kogut/Zander 1992]. However, implicit knowledge also has a cognitive dimension; we posses it in the form of embedded mental models, beliefs and perspectives, so that we regard it as reliable and indisputable.

An effective knowledge management should therefore deal with instruments that support both, the transfer and share of implicit and explicit knowledge. Technical KM approaches, which set tools as centre point, are specialised on dealing with explicit knowledge, which can be stored and transferred e.g. in portals. While human oriented approaches mainly deal which implicit knowledge, that can only be exchanged by individuals. Therefore, a knowledge management approach which aims to deal with implicit knowledge should include organisational forms, which enable individuals to share there knowledge and should also build a knowledge base for implicit organisational knowledge in a specific field within the company. In the following section the potentials of portals, as one instrument for a technical oriented approach, and the potentials of organisational forms, as part of a human oriented KM

¹ It is the "know-what" and "know-that"; see Kogut/Zander 1992 and Ryle 1949.

approach, are briefly described to introduce afterwards the inherent value of the combined approach in knowledge networking.

Potentials of ICT e.g. portal components for transfer and share of explicit knowledge

According to Shilakes and Tylman [1998] a portal is an instrument to:

- Certify, integrate and manage a large amount of heterogeneously structured (e.g. databases) and semi-structured (e.g. documents) data stores.
- Provide structured navigational and search access to the integrated data.
- Offer personalization of content based on the users business role based on filters (passive) and agents (active).
- Support virtual collaboration based on available information technology.

Each of these challenges can require the utilization of information technology and information management. Knowledge Portals are information systems processing and delivering embodied knowledge. According to Kotorov and Hsu [2001] the value of delivered knowledge is dependent on its timeliness, its accuracy and its presentation. A portal cannot directly enhance the corporate value creation, because as a system it is not able to decide which knowledge is critical for economic success. It can however reduce the cost of knowledge retrieval and gather additional competitive advantage by extracting knowledge out of information the competition cannot process [White 2000].

Bair [1998] provides a technology based generic knowledge portal system approach, according to which a portal can be structured into four elements:

- Access Medium: The access medium creates a large physical or logical database, that contains all data available through the portal.
- Search Engine: The search engine attaches on the access medium and uses the data pool as basis for its spiders creating a normalized index.
- Taxonomies, Auto-classification and Category Navigation: The classifier creates taxonomies and a glossary/thesaurus [Kremer & Riempp 2001] based on the data provided by the access medium.
- Assessment, Filtering and Collaboration: Filters, tracers and agents provide a toolkit for the user to explain his personal criteria for valuable knowledge to the system. Workflow systems, discussion databases and instant messaging

systems allow a fast dissemination of discovered knowledge to other individuals.

The main advantage of portals in comparison to traditional intranets is the provision of a one stop service concerning encompassing embodied knowledge retrieval [Reneker/Buntzen 2000, Gebert/Enkel 2002].

Potentials of organizational forms to share and transfer implicit knowledge

In order to share implicit knowledge, it is necessary to combine individuals and give them the opportunity to share their knowledge over an extended period of time [see Krogh/Nonaka/Aben 2001]. Therefore, to manage implicit knowledge it is necessary to create an organizational form which will connect knowledge agents with the valuable implicit knowledge that should be shared.

Within the company there are several organizational forms, beside the matrix organization, that aim to transfer implicit knowledge such as informal networks, expert groups, Communities of Practice, or formal networks such as Knowledge Networks. These organizational forms are used to fulfil tasks within the company which cannot be fulfilled by the companies` organizational structure itself. This overlying corporate structure is therefore of huge importance for a company, has various goals, or solves different tasks.

The organizational form of a Community of Practice seems to be a suitable and popular form for sharing implicit knowledge within the company [see Orr 1990; Brown/Duguid 1991, Lave/Wenger 1991, Snyder 1999, Wenger 1998, Wenger/Snyder 2000; McDermott 1999, 2000, Enkel et al. 2000] but it also entails problems for the targeted collecting and transferring of knowledge.

A Community of Practice consists of a group of people who are linked together by a common ability or a shared interest, and who consequently have a common practical experience, specialist information and intuitive knowledge. Each group develops its own social and cognitive repertoire governing its actions and interpretations. The process of knowledge exchange takes place on an informal basis, and the members of such a Community develop a single identity – as well as shared values and knowledge – by solving common problems, becoming involved in their mutual work and sharing their everyday concerns. [see Orr 1990; Brown/Duguid 1991 and Wenger 1998]. A problem arises from their voluntary participation in the community and the defining of their topics. The members are willing to participate as long as they

have a shared personal interest. This makes the Community of Practice hard to manage, i.e. to focus on solving problems for the company, or storing knowledge that is required to gain a competitive advantage. Another organizational form that combines the positive knowledge sharing capabilities of a Community of Practice with manageable task solving, or orientation at a business process, is called Knowledge Networks.

But if we can combine an organizational form like a Knowledge Network, which represents a device for the storage and transfer of implicit and ICT (information- and communication technologies) like portal components which offers an ease access to the organizational explicit knowledge, we can create a knowledge management instrument that will be able to manage both implicit and explicit knowledge.

The concept of knowledge networking

The members of a network share information, experience and insights and are supported by various tools. The members are part of the network, because they have implicit knowledge that is valuable for the company. A Knowledge Network also represents a common body of knowledge and its members therefore exchange knowledge efficiently. They achieve this efficiency by exchanging anecdotes about, for example, specific solutions to problems. The internalised knowledge is not written down, but is exchanged directly.

The network concept has been used in many different forms [Nohira et al. 1992; Sydow 1992]. While some approaches focus more on the structural aspect of networks, others tend to emphasize the processes or the relations within/between networks more. Distinctions have also been made between macro and micro perspectives on networks. The following table, based on existing literature, provides an overview of the different contributions to networks.

Structural	Relationship-	Process-orientated
approaches	orientated approach	hes approaches
focus on forma	tion, focus on interaction a	and
characteristics	and relationship dimension	on focus on development
organization		and content of

			processes
Macro			
perspective	• [Miles/Snow	• [Powell 1996]	• [Ring/Van de Van
(strategies,	1986]	• [Provan/Milward	1994]
conceptuality)	• [Sydow 1992]	1995]	
ooooptaaty	• [Thorelli 1986]	• [Renz 1998]	
	• [Williamson		
	1991]		
Micro			
perspective	• [Sydow et al.	• [Chrisholm 1989]	• [Larson 1992]
(actors,	1995]	• [Human/Provan 1997]	
situation)	• [Uzzi 1997]		

Figure 1: Approaches in network theory [Seufert et al. 2002]

Knowledge Networks focus on the members' knowledge exchange. They are social networks, which can be defined as "a specific set of linkages among a defined set of actors, with the additional property that the characteristics of these as a whole may be used to interpret the social behaviour of the actors involved" [Mitchell 1969, S. 2; Tichy et. al. 1979, S. 507; Alba 1982, S. 40; Lincoln 1982]. The term network focuses on the social relationship between the members. This relationship can be categorized according to contents (e.g., products or services, information, emotions), form (e.g., duration and closeness of the relationship) and intensity (e.g., communication-frequency), whereas the form and intensity of the relationships establish the network structure [Alba 1982, pp. 42-43]. Following Bardacco who stated "Most important, in an age of rapidly proliferating knowledge, the central domain is a social network that absorbs, creates, transforms, buys, sells, and communicates knowledge. Its stronghold is the knowledge embedded in a dense web of social, economic, contractual, and administrative relationships" [Badaracco 1991, pp. 13-14] this means that a network can be seen as the ideal form to store and transfer knowledge.

The term Knowledge Network is used "to signify a number of people, resources and relationships between them, who are assembled in order to accumulate and use knowledge primarily by means of knowledge creation and transfer processes, for the purpose of creating value" [Seufert et al 1999, pp. 12].

Knowledge Networks as instruments for knowledge management

Knowledge Networks are instruments for knowledge management, because the network structure includes the ability to connect knowledge agents (knowledge owners) in the company who are not connected through the hierarchical and functional barriers of the matrix organization [Probst et al 1997; pp 255, Seufert et al. 1999, Back et al. 2001; von Krogh et al. 2002]. Therefore, networks provide a platform for knowledge exchange between its members. On this network level, knowledge management is mainly a knowledge owner management, meaning the network should support the members and the knowledge process through an appropriate environment and tools. The concept of Knowledge Networks was first conceptualised by Seufert, von Krogh and Back [see Seufert et al. 1999], but Knowledge Networks have been successfully used by many international, knowledge management experienced companies during the last four years [see the findings of an international survey to Knowledge Networks by Enkel/Wicki 2001]. A Knowledge Network offers a company, whose employees are distributed across the world, or whose structure is very decentralized, the opportunity to access it everywhere and, subsequently, to use its knowledge. However, this need for a virtual organizational form applies particularly to Knowledge Networks.

Knowledge Networks firstly pursue a specific strategic goal and secondly, can support more than one business goal simultaneously. Research showed that Knowledge Networks primarily support or pursue one of three business goals: (1) risk minimization, (2) increasing innovation, and (3) increasing efficiency [the research centre KnowledgeSource has been doing research in the area of Knowledge Networks since 1987; see www.knowldgesource.org, see also Krogh et al. 2000]. The Knowledge Network serves to increase efficiency in the sense that, for example, the rendered procedure enhances efficiency within projects through an obligatory statement that, e.g. all information and results of the project have to be collected on a database and thus be made available to all employees. At the same time, the risk can be minimized of a possible miscalculation of time or budget in a similar project, or that existing solutions will be duplicated. Research has further shown that Knowledge Networks can support most business processes [Enkel/Wicki 2001]. Knowledge Networks do therefore represent an organizational possibility for determining tasks within a company and/or for supporting business processes and can support primary

or secondary business processes [see Porter 1985], thus creating value for the company.

Reference model for Knowledge Networks

In a Knowledge Network we differentiate between three different layers, which describe the network and which interrelate strongly with one another. The first layer Facilitating Conditions describes the environment in which the knowledge processes and the work of the network takes place. The second layer describes the Knowledge Work Processes. This includes all processes and procedures between the members of the network. The third layer is the layer of the network Architectures, that describes the structure of the network and the supportive tools. These tools are organizational tools as well as information and communication tools and systems. The next figure shows the structure and interdependences of the different layers.

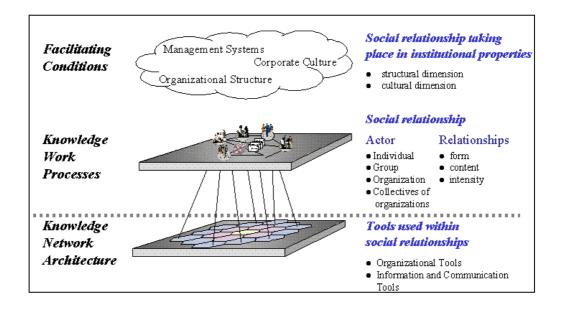


Figure 1: Reference model of a Knowledge Network [Seufert et. al. 1999]

Facilitating Conditions

The Facilitating Conditions within the company influence the behavior of the network's members and the processes. The Facilitating Conditions include, for example, the company's management system, the organizational structure and the corporate culture. They can be differentiated in structural and cultural factors which can be either supportive of or counterproductive to the work of the Knowledge

Network. Cultural factors are, for example, a knowledge friendly or unfriendly culture, the general motivation for knowledge sharing or leadership in the company. These factors cannot be influenced directly. Structural factors are, for example, the network size or the objectives and tasks of the network. They could also be supportive or counterproductive, and can be directly influenced.

A network can also create its own Facilitating Conditions, which could be different from the corporate Facilitating Conditions, and which could influence these [Giddens 1991]. The network leader's caring behaviour, for example, could positively influence the atmosphere and therefore influence the members' knowledge sharing behaviour [for the concept of *Care* see von Krogh 1998]. The members' knowledge sharing behaviour will not only be focused on their work in the network, bit will also influence the sharing culture of the company as a whole.

Knowledge Work Processes

The processes layer also includes, beside the knowledge processes "locate and capture", "share and transfer" and "creation" of new knowledge, the procedures to fulfill the network's specific task. This task is related to the business process the network wants to support and has to do with the transformation of one type of knowledge (implicit or explicit) to the other. This task is called the "Operational Knowledge Task". It creates the interface between the knowledge processes and the corporate processes. Beside these processes, this layer describes the members of the Knowledge Network., their roles and responsibilities.

Architecture

The third layer of a Knowledge Network consists of the structure of the network (the topology), and the supportive tools (like portal components). These tools serve to support the Knowledge Work Processes, but also to create the appropriate environment (the Facilitating Conditions) for the work of the Knowledge Network. There are specific tools for the support of the various main tasks, but also for the network's different lifecycle stages. These tools can be divided into two main categories, the organizational tools, e.g. reward systems to motivate the members, or regularly meetings to support the knowledge processes, and information and communication tools, e.g. email, instant messaging systems, knowledge portals or

video conferencing tools to support the virtual communication or repositories to manage explicit knowledge documents.

By combining the organisationale form of a Knowledge Network to support the transfer and share of implicit knowledge through the cooperation of knowledge owners and the potential inherited in ICT, e.g. portal components to store, transfer and share explicit knowledge and support the communication of the network members we can create leverage and multiply the potential of both knowledge management instruments.

Conclusion

As mentioned before, technical approaches to manage manly explicit knowledge and human oriented approaches, to deal with the implicit knowledge of knowledge owners, do have huge potentials.

Information and communication technologies like portals provide employees in a comfortable way the access to the explicit organisational knowledge by providing data bases to store documents, including a search engine and personalizing filters to find the explicit knowledge that is needed, as well as including support functions for the transfer and share of explicit knowledge. The portal therefore serve as storage and transfer device for explicit knowledge.

Organisational forms like Communities of Practice connect knowledge owners to aim the transfer of implicit knowledge which is captured in individuals and could only be transferred through their interaction and cooperation. Knowledge Networks are more formal than other organisational forms like e.g. Communities of practice. Through the Facilitating Conditions of the network, which include the organisational structure, the company culture and the management systems, that are slightly different than the Facilitating Conditions of the whole company, the networks creates a micro-climate which enables and motivate the individuals to share their implicit knowledge. The layer of the Knowledge Work Processes within the reference model of Knowledge Networks includes the knowledge processes but also the connection to the business process to create a real value for the company through the cooperation of the knowledge owners. It also includes the description of the task which helps to select the appropriate members for the network and gives their work a direction. The network therefore represents a knowledge base through the connection of individuals with the valuable implicit knowledge according to a specific topic.

If we can combine an organizational form like a Knowledge Network, which represents a device for the storage and transfer of implicit and ICT (information- and

communication technologies) like portal components which offers an ease access to the organizational explicit knowledge, we can create a knowledge management instrument that will be able to manage both implicit and explicit knowledge. Knowledge networking will be a more holistic knowledge management approach. Therefore, the third layer of the Knowledge Network consequently includes the support through tool like ICT and organisational tools. A knowledge portal could support the work of the network members through providing the appropriate explicit knowledge like patents, guidelines or handbooks and help them to combine this knowledge with their own implicit knowledge to create new valuable knowledge for the company. Therefore, the network could be a storage of and transfer device for both, implicit and explicit knowledge of the company.

Further research fields

The following section should show a brief overview about the future research field of the research in the field of Knowledge Networks.

After successfully implemented Knowledge Network within organizations to support knowledge transfer and share, the KnowledgeSource team² assume that the inherent potential of Knowledge Networks can also be used for challenging fields which are linked to company growth. Therefore, the new competence centre Knowledge Networks for Growth (from 2001 to 2003; see www.knowledgesource.org) was founded to focuses on fields in which Knowledge Networks – when implemented in the company – can cross the boundaries of the firm and can promote to company growth. We identified several fields which inherent the potential to support company growth. This fields can be clustered in three main groups of topics, with strong interrelations. The first field describes the topics of launching corporate new ventures in new markets or a new business that doesn't fit to the company strategy, and therefore should be developed as a corporate new ventures from single entrepreneurs. The second field includes the issues of customer knowledge integration and therefore cross the boundaries within the organization by integrating the customers and there knowledge within the company to gain value for the company. The third research field is the area of people and knowledge integration after a mergers and acquisitions. Most mergers and acquisition failed by lacking in the integration process and therefore, this field also gain huge advantage if integration can be improved.

An example for Knowledge Networks in challenging field is a project with a large computer company. This company (in this paper will be called "Comp") wanted to develop more customer oriented services and products to gain competitive advantage and reach company growth. One premise within Comp was that the customer know their products better than they know because the customer works every day with the products and know what services he needs to help by his daily business. Comp decided to build up a Company-Customer Knowledge Network with the help form the KnowledgeSource team. Therefore, we uses our previous research as foundation and adapt the network to this new challenging field of working with customers. Questions that strikes us where for example "How to motivate the customer to share his knowledge?" or "Who is the appropriate customer with the valuable knowledge to work in this network", and "What tasks can this network solve?".

To find the appropriate customer was a task we solved though the involvement of departments within Comp that are in frequent contact with the customers like the support line, the sales and the marketing department. We selected the customer not according there size but according to the knowledge they have and the customer group they could represent. Through literature research and interview with customers we find out that the task to solve is one of the crucial points. When the task of the network is something that creates value for Comp and for each customer involved the customers would be motivated to share their knowledge. Also the time to solve the first task and to see the first success should be as short as possible. The selection of the appropriate task could only be done properly in a kick off event for this network with the future members. We decided to provide the customers in this kick off event a proposal with several tasks which are "Quick Wins" and gain value for all participants.

Beside the field of customer knowledge integration we are actually working at concepts and methods to build up Knowledge Networks in the fields knowledge integration after Mergers and Acquisitions, and support of corporate new ventures through Incubator Knowledge Networks. Beside the testing of the mentioned reference model we want to investigate which factors change by adapting the network in other fields and which a robust. It is also our aim to develop a methodology to build up and maintain such networks within the company.

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