

Knowledge Networks: Linking Knowledge Management to Business Strategy

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Competence Center Knowledge Networks

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1 INTRODUCTION

In previous research, the KnowledgeSource has mainly focussed on: (1) an in-depth understanding of the concept of knowledge and knowledge networks, (2) facilitating conditions for knowledge networks, (3) knowledge networks processes, and (4) knowledge network tools. Even though different characteristics of knowledge networks had been discussed in earlier workshops, this was never systemized. What lacked was a coherent distinction of those knowledge networks based on their purpose.

The objective of this paper is twofold: First, to achieve a classification of knowledge networks along business goals and second, to cluster the different characteristics of knowledge networks according to these business goals in order to be able to measure the success of knowledge networks and to create ideal profiles for these networks. We use the term "Knowledge Networking" to signify a number of people, resources and relationships among them, who are assembled in order to capture, transfer and create knowledge for the purpose of creating value. By suggesting that knowledge network characteristics differ according to the business goal they are mainly dedicated to, this paper shows that a deeper understanding of the business strategy of a knowledge driven company is necessary in order to develop and nurture an appropriate knowledge network.

After presenting the term knowledge network within the existing organizational and sociological literature we focus on the overall characteristics of knowledge networks. Those characteristics are then clustered along business goals a knowledge network can be attached to. The role of knowledge and knowledge management in companies is analyzed and we argue that knowledge has to be used as a resource in order to create competitive advantage. The business goals are then determined and some suggestions are made concerning their measurement. It is argued that knowledge networks can be distinguished according to the business goals they follow, which can be innovation, efficiency or risk optimization. Then we identify knowledge processes and look at the evolution of knowledge management at companies regarding these processes. By establishing the business strategy context we aim at underlying our framework with an empirical study. Finally, there are some implications for our future development of the framework.

2 KNOWLEDGE NETWORKS AND THEIR CHARACTERISTICS

The importance of networks has become somewhat ubiquitous and pervasive as the way humans will communicate and connect with each other in the twenty-first century. Organizations which demonstrate high degrees of integration (teamwork, sense of purpose) and discretion (looseness in distribution of authority, lower control needs) are said to be more likely to be capable of the rapid and re-configurable responses that underpin competitive advantage (Palmer & Richards 1999). Networks are about to change our culture and behavior, change our vocabulary, they build the framework to enhance improved collaboration and they are about relationships that create the glue for an effective leverage of collective intelligence. On the one hand knowledge networks challenge the way we make sense of the world, on the other hand the challenge the way we make sense of ourselves.

The focus of this chapter is to understand better our notion of knowledge networks arising from previous research. Before conceptualizing the characteristics of knowledge networks along relationships, members, and knowledge, we will first give a theoretical background on networks and knowledge networks.

2.1 Defining Knowledge Networks

2.1.1 *Network Theory*

The concept of network has been used in many different forms and is often not understood coherently (Nohira, 1992). While some approaches focus more on the structural side of networks, others tend to emphasize more the processes or the relations within/between networks. On another dimension, distinctions have been made between macro and micro perspectives on networks. Table 1 gives an overview of different contributions on networks within the existing literature.

	Structural approaches focus on formation, characteristics and organization	Relationship orientated approaches focus on interaction and relationship dimension	Process orientated approaches focus on development and content of processes
Macro perspective (strategies, conceptuality)	- Williamson (1991) - Thorelli (1986) - Sydow (1992) - Miles/Snow (1986)	- Powell (1990) - Provan & Milward (1995) - Renz (1998)	Ring/Van de Ven (1994)
Micro perspective (actors, situation)	- Sydow et al. (1995) - Uzzi (1997)	- Chrisholm (1989) - Human & Provan (1997)	Larson (1992)

Table 1.: Contributions to Network Literature

The term “networks” can be interpreted as connections between individuals, groups, or organizations, as well as between collectives of organizations. In all these cases, the “network” construct demands a description and analysis which does not concentrate only on a section of the relationships existing between the network participants and network relationships, but also a description of the network in its entirety. According to a frequently quoted definition, a social network can be seen as: „a specific set of linkages among a defined set of actors, with the additional property that the characteristics of these linkages as a whole may be used to interpret the social behavior of the actors involved“ (Mitchel 1969, p. 2; Tichy/Tushman/Fombrun 1979, p. 507; Alba 1982, p. 40; Lincoln 1982). Consequently, the term “network” designates a social relationship between actors. Besides formalized networks, the literature stresses the importance of informal networks as the results of and prerequisites for decision-making processes in organizations (Morgan 1986, pp. 173-174; Sandner 1990, pp. 147-151), the importance of the interconnection of organization-wide actions (Probst 1987; Luhmann 1988), and the influence of managers’ positions in the internal network on their cognition and information-processing (Walker 1985).

To sum up, one should note that our idea of “network” as a very dispersed and de-centered chain of ongoing and mutant activities (e.g., Lee and Brown, 1994). Thus, networks is approached as a topography and as performance, rather than as a final or original state. The constantly rethinking of the network, activities and rotations within a network are thus core processes within a network (Seufert; von Krogh; Back, 1999).

2.1.2 Knowledge Networks

Knowledge is increasingly recognized by modern organizations as their most important source of lasting competitive advantage. However, the key to obtaining long-term competitive

advantage is not to be found in the administration of existing knowledge, but in the ability constantly to generate new knowledge, and to move on to new products and services (von Krogh/Venzin 1996). Rather than viewing firms as devices for processing information, making decisions, and solving problems, one should realize that they are based increasingly on knowledge-seeking and knowledge-creation.

In order to conceptualize the integration of networks and knowledge management, we will outline on the one hand our knowledge-networking approach, which differs from traditional knowledge management concepts, and on the other hand illustrate certain selected benefits of knowledge-networking. In order to integrate networking and knowledge management, two aspects have to be considered. First, knowledge management should comprise a holistic view of knowledge, that is to say, the integration of explicit and tacit knowledge. Second, knowledge management should take an holistic view on where or rather how knowledge is being created and transferred.

Definition

We use the term "Knowledge Networking" to signify a number of people, resources and relationships among 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.

Looking at the development of knowledge networks, we distinguish between emergent and intentional ones. Intentional knowledge networks are seen as networks that are built up from scratch, whereas emergent knowledge networks already exist but have to be cultivated in order to become high-performing. In this way, a network may evolve whose participants share a common language, and a common set of values and objectives. This (social) network is backed up and transformed by information- and communication technology. As this network of knowledge-resources is continuously being augmented by knowledge gained from learning situations, a Knowledge Network should be regarded as a dynamic structure rather than as a static institution.

The integration of networking into knowledge management yields great benefits. The openness and richness of networks are believed to foster a fertile environment for the creation of entirely new knowledge, while also accelerating the innovation rate. *Powell/Koput/Smith-Doerr* (1996) demonstrated a ladder effect, in which firms with experienced partners competed more effectively in high-speed learning races. Rather than trying to monopolize the returns from innovative activity and forming exclusive partnerships with only a narrow selection of organizations, successful firms positioned themselves as the

hubs at the center of overlapping networks, stimulating rewarding research collaborations among the various partner-organizations. Reliance on networks has potentially transformative effects on all participants. Those positioned in a network of external relations adopt more administrative innovations, and do so earlier. The presence of a dense network of collaborative ties may even alter participants' views on competition. Inside a densely connected field, organizations must adjust to a novel perspective in which it is no longer necessary to have exclusive ownership of an asset in order to profit from it. Moreover, since a competitor on one project may become a partner on another, the playing field resembles less a horse-race and more a rugby match, in which players frequently change the color of their jerseys (Seufert; von Krogh; Back, 1999).

In sum, regardless of whether networking is driven by gaining access to new knowledge, or by creating and transferring knowledge, connectivity to a network and competence at managing networks have become key drivers of a new business logic. A framework for knowledge networking could be helpful in order to give it structure and reveal interdependencies.

2.2 Characteristics of Knowledge Networks

Knowledge networks can have different profile features. Taking one step back from our definition of knowledge networks we identified that project teams, task forces, communities of interest or communities of practice are all knowledge networks in a sense: knowledge is transferred, shared, applied, and created between actors within a web of relationships. In this chapter we will first outline the different existing concepts where knowledge is transferred, shared, applied, and created. However, those concepts do not tell the whole story about knowledge networks. We think that there are other distinct characteristics of knowledge networks. Additionally, in contrast to task forces, project teams, communities of practice and interest, knowledge networks' designated task is to capture, transfer, share, apply, and create knowledge in order to contribute to the defined business strategy.

In this chapter, we will first identify from existing concepts as well as from other sources various characteristics which we regard as being important for knowledge networks. In a second step, we will then cluster all characteristics of knowledge networks along the dimensions members, relationships and actors. Figure 1 gives an overview of this course of reasoning.

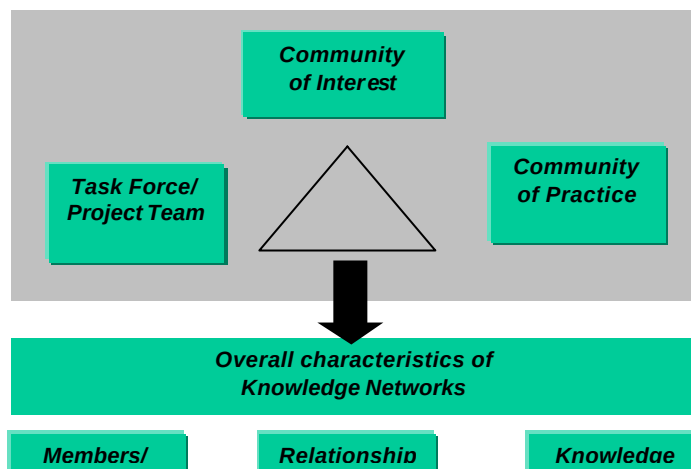


Figure 1: Overview on course of reasoning

2.2.1 Existing Concepts

A **Project Team/Task Force** represents a group of people having a specific issue or a problem to solve in order to achieve a desired goal. This common goal provides cohesion for the group's identity and commitment. Whereas in a community people share a common knowledge base, members of teams are more conscientiously selected from diverse fields and crafts to intentionally produce a creative abrasion and intellectual conflict between their diverse viewpoints, thus establishing energy that is channeled into new ideas and products (Leonard-Barton, 1995). Additionally, a team life-cycle is determined by an institutional schedule. It is temporary and ends mostly with the accomplishment of the task.

A **community of interest** is for example a platform on the internet, where a group of people in a loose confederation share common interest in, and information about their interest. Contact between members may be sporadic, due to the lack of cohesion and shared purpose other than the sharing of information. Members of such communities know what the interests of other members are. The absence of an implied practice and the relatively low involvement of group members (Wenger, 1998) does not foster high-care relationships. In a community of interest the participants are interested in exchanging information with minimal involvement and time effort.

A **community of practice** is a group of people who are to a large extent involved in similar work in a common craft. They are an integral part of our daily lives. Human beings are constantly engaged in the pursuit of enterprises of all kinds and in daily work, have

interaction with others, carry out similar tasks or undergoing similar experiences. Learning theorists like Orr (1990), Lave and Wenger (1991), Wenger (1998), but also Glynn (1999) systematically observed processes in operational settings which they called communities of practice. By engaging and working together, the group disposes its know-how by putting it into practice. The community thus develops in the course of their ongoing routines. The personal interests and engagement of participants allows a high-care relationship within the community, thus by letting individuals to share their intuition, judgement and common sense with other colleagues. Self developed roles and a sense of a joint enterprise nurtures a shared repertoire of collectivity. These characteristics, supported by a sense of friendship and loyalty, establishes cohesion among community members through mutual engagement, binding members together into a social identity (Wenger, 1998).

Table 2 gives an overview of knowledge network characteristics.

• Formal/informal • Development (Emergent/Deliberate) • Duration life cycle • Size (small/large) • Openness (Barriers, Entry and participation possibilities) • Co-operation/Competition • Power/Dependency • Friendship/Professional • Hierarchy/Flat Organization • Geographical Scope (narrow/broad) • Standardized • Resources • Contract Design • Management support • Integration in business process • Ownership (Business/members) • Personal Skills/Capabilities • Experience • Personal Knowledge (tacit/explicit) • Awareness of knowledge (of others and one self) • Personal perspective on work • Intensity of relationship • Frequency of relationship	• Communication skills • Working area • Speed (set up/flow) of relationship • Interfaces (high/low) of relationship • How long (past/future) • Direction/Orientation (input/output) • Reciprocity Form (multiplexity, connectivity, redundancy, stability, mutual engagement) • Personal aims • Identification/Commitment towards the network • Personal involvement /interest/goal • Previously established care • In the relationship with other members. • Role in the Network • Location in the network • Membership of other Networks • Power (relational) • Expectations • Membership of CoP's? • time effort • Benefit taker	• Task to fulfil • Direct/Indirect • Use of tools • Media richness • Centralized/decentralized communication • Social/Normative Content: • Shared experience • Shared practice • Shared identities (cohesion) • Shared norms and values • Sharing and caring culture (Loyalty, egalitarian/non-egalitarian) • Conflict handling, Diversity • Sustained mutual engagement • Shared language, metaphors, analogies • Objectives shared • Shared aims/interests/ Common Interests? • Continued re-structure of relation by communicating • KN share a social identity and thus build a knowledge network • Shared (social) tacit/explicit knowledgecommunication
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Table 2.: Overall characteristics of knowledge networks

2.2.2 Clusters of Characteristics

In order to correspond these characteristics into our framework we clustered them along our definition of knowledge networks into members of knowledge networks, relationships and knowledge.

Members. Actors or members in a social network can be persons, groups, but also collectives of organizations, communities or even societies¹. This includes the collective value of an organization's know-how, equal to the investment an organization must make to re-create the knowledge of its employees. The employees' minds, and the files they manage, carry a share of the company's knowledge capital. This makes every employee a custodian of the most important assets a firm owns. To evaluate an organization we have to map the skills of the members of knowledge networks. Skills can be specialized or more T-Shaped (Leonard, 1995). People differ in their ability to communicate, their experiences within a certain industry or field and in their susceptibility to benefits.

Members of knowledge network take different roles. From an organizational perspective, customers, suppliers, competitors or government organizations as well as employees have distinct functions within a network (Freeman and Reed 1983). Additionally, members within the network can contribute actively or passively or even have the purpose of a knowledge manager.

The type of membership within the network can be very task orientated or output orientated. While some members may identify strongly with the network and show a high level of care, others may be less attached to the knowledge network and commit less to it. The type of membership can vary substantially from ones position within the network. A member can be more at the core of the network or more at the boundaries, take the role of the knowledge activist (Von Krogh et. al. 1997) or a knowledge sponsor.

Relationships. In order to create connectivity of the members through interactivity in a network we have to examine closely the relationships. The characteristics of relationships are the "platforms" for knowledge exchange. Relationships within networks can vary in duration, intensity as well as the frequency of the interaction. The form and intensity of the relationships establishes the network structure (Burt 1979; Alba 1982, pp. 42-43). This implies naturally the personal involvement, commitment, and care behind the relationship. The way how members of knowledge networks communicate is also about how they use communication tools and the media richness of the relationship describes distinct characteristics of the relationship. The connectivity of a knowledge network depends on the other hand on the size of the network. Centralization, formalization, posture or geographical scope of the knowledge network influence the way knowledge is exchanged. Entry barriers, participation possibilities and ownership can limit the flow of knowledge. Moreover, the

¹ Cognitive psychology, it should be noted here, examines a human being as a cognitive network. It regards an individual as a network of constructs (Kelly 1955). Since the studies of Bavelas (1950) on communication in groups, the latter have become conceptualized as social networks.

integration in business, the origin of the network and the ownership play a distinct role whether the knowledge network can be directed by a manifested (informal) leader or by management.

The relationships evolving between actors 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). Typically, network relationships are characterized by a multiple mixture concerning form and contents, i.e., the relationships between actors are of various forms, which may consist of diverse contents to be exchanged.

Knowledge. As stated earlier knowledge can be of different kinds: it can be tacit or explicit, social or individual. Even though individual knowledge plays an important role within knowledge networks, we argue that social knowledge (the common, shared knowledge) is per se prevalent. The extension of tacit and explicit within a knowledge network is one of the major distinctions of our categorization of knowledge networks.

The possible features of members, relationships and knowledge of a knowledge network we classified along the two dimensions *characteristics of members/relationships* and *type of membership/relationships*.

Table 3 gives an overview of the clusters of characteristics and types of the Knowledge Network elements members, relationships and knowledge.

	Characteristics	Type
Members / Membership	Specialized skills Communication skills Technical skills Availability Industry experience Working experience Susceptibility to benefits	Task orientation Identification towards the network Commitment Care Personal power Role in the network Membership in other networks
Relationship	Intensity Frequency Speed of setup form of communication Media richness Use of communication tools Friendship	Size of network Centralization Formalization Entry barriers Ownership Posture Integration in business Origin of network Geographical scope Participation possibilities Development of network Trust
Knowledge	Shared common experience Shared common practice Shared norms and values Shared language, metaphors Shared objectives, aims, interests	Explicit Tacit Systemic Conceptual Routine Experience

Table 3.: Cluster of the Characteristics and Types of Knowledge Network elements

3 BUSINESS STRATEGY

3.1 The role of Knowledge and knowledge management in companies

In the past, companies were deriving their strategies more from their surrounding and less according to the specific context of the company (von Krogh; Roos, 1992). Just in the last ten years has a new view emerged: the „Resource based view“ (Selznik, 1957 and Penrose, 1959). It is regarded as being complementary to the „Environment based view“ and explains competitive advantage through differences in the endowment and combination of critical company resources and not according to which industry one company belongs to (Wernerfeld, 1984; Dierickx; Cool, 1989; Amit; Schoemaker, 1993; Grant, 1991 and Hall, 1992, 1993, 1994). This new view came, through the introduction of the concept of “Core Competencies” at the beginning of the 90's to the center of the strategy discussion (Prahalad; Hamel, 1990; Collis, 1991 and von Krogh; Roos, 1992). The two “pioneer” - authors, *Prahalad* and *Hamel*, described Core Competencies as company wide strategic meta-abilities, which lead to competitive advantage in many business units (Prahalad; Hamel, 1990). Based on this concept, many diversified companies started to look for abilities inside the company, which could be leveraged across more business units in order to create business value. The main task of management was to deploy and consolidate business unit - specific abilities, which had to be linked to create core competencies for the company as a whole (Campbell; Goold, 1992). The problem here was that the literature on core competencies gave little advice on how to practically implement those ideas. There were still questions left unanswered regarding the identification (Rogulic, 1999) and the consequent advancement of these abilities.

These unanswered questions, combined with the devastating consequences of the mostly very one-sided implementation of the concepts like „Business Process Reengineering“ and „Lean Management“, led at the beginning of the 90's to the development of the discipline „Knowledge Management“. In this respect the „Resource based view“ was developed further, since knowledge is being regarded as another resource. *Peter Drucker* is talking about a „Knowledge society“, in which knowledge is more important than the traditional production factors work, capital and land (Drucker, 1990, 1993, 1994). Many authors (Toffler, 1990; Quinn, 1992 and von Krogh; Venzin, 1995) describe knowledge as the single most important source of sustainable competitive advantage and thus also as a source for generating value in the modern company. *Nonaka and Takeuchi* describe this as follows: „In an economy where the only certainty is uncertainty, the one sure source of lasting competitive advantage is knowledge.“ (Nonaka; Takeuchi, 1995)

Gilbert Probst defines Knowledge Management as „the improvement of organizational capabilities at all levels of the company through a better utilization of the resource knowledge” (Probst; Romhardt, 1999). The task of Knowledge Management is to advance the knowledge work processes like “Localizing and Capturing”, “transferring” and “creating” through concrete activities.

Although a lot has been written in the past few years on Knowledge and Knowledge Management, the literature has not given managers a clear “road map”, which can be used at a specific and concrete level in the organization and in relation to the strategy of the company. This becomes a big problem, especially in companies with a widely dispersed knowledge base. In such cases a professional, strategy-oriented Knowledge Management is needed. Moreover a Knowledge Strategy is needed, in order to concentrate on the knowledge work processes and combine them in such a way, that they contribute to the overall goals of the company. This is one of the aims of this paper.

Before we elaborate on the subject of choosing a strategy for dealing with the knowledge of the company, a short introduction into the role of knowledge and knowledge management regarding the creation of sustainable competitive advantage is given.

Knowledge as a source for creating competitive advantage

Many contributions in the field of „Resource based view“ have categorized organizational resources (Hofer; Schendel, 1978; Grant, 1991 and Mahoney; Pandian, 1992) and described their influence on the creation of sustainable competitive advantage.² *Barney* values resources regarding their ability to create sustainable competitive advantage according to four criteria: (1) Value creation, (2) Rarity, (3) Possibility to imitate (4) Possibility to substitute. The last two criteria are being regarded as the determinants of whether sustainable competitive advantage can be created, not least because of ever increasing complexity and dynamism of markets. In the literature knowledge is being discussed in increasing frequency concerning imitability (von Krogh; Roos, 1996b). It is very often difficult to imitate valuable knowledge. This has many reasons. First of all, this knowledge developed over a longer period of time and is very closely related to the development of the company. Secondly, many knowledge components are intertwined in a very complicated manner, so that it is almost impossible to isolate single elements. Thirdly, it is very difficult to clearly derive a certain competitive advantage from a certain piece of knowledge (Reed; DeFillippi, 1990 and von Krogh; Roos, 1996b). The consequence of this is not that it is generally very difficult to imitate knowledge, but rather that the possibility to imitate knowledge depends very much on

² A more detailed discussion of this can be found in: Barney (1992); Grant (1991); Peteraf (1993) and Nonaka, Takeuchi (1995)

its manifestation. In the literature there is a distinction between implicit and explicit knowledge (Polanyi, 1985), though this should be understood as a continuum. The more implicit the knowledge, the more difficult it is to imitate and transfer. Implicit knowledge components are regarded as hidden knowledge, which can only be accessed indirectly. Very often a person knows how to do certain things, without being able to verbally externalize and transfer this knowledge.³ Implicit knowledge can be described with dimensions like motivation, experience, intuition or “gut-feeling”. Explicit knowledge components on the other hand include facts, which can be shown in text, sound, picture or language. This sort of knowledge can easily be saved and transferred through IT technologies.

In the following the business goals will be introduced, which help classify Knowledge Networks on the one hand and measure their performance according to the degree of goal achievement on the other hand.

3.2 Determining the business goals

Modern management doctrine has shown in theory as well as in practice, that it is especially middle- and long-term goals, like efficiency improvement, increased innovation and risk optimization (von Krogh et al., 1999), that lead to sustainable competitive advantage (Porter, 1985; Bleicher, 1991 and Prahalad; Hamel, 1990). There are also many indications in the literature that the discipline of knowledge management is most successful, when it comes to middle- and long-term goals (Nonaka; Takeuchi, 1997; von Krogh; Roos, 1996; Senge, 1996 and von Krogh; Venzin, 1995). The aim of the strategic goals is to give an orientation when developing and choosing a strategy, especially a knowledge strategy. Through the alignment of the knowledge advancement activities with the overall, for all the business units coherent strategic goals, it can be made sure, that the local efforts help fulfil the strategy of the company. It is also our aim to classify Knowledge Networks according to these business goals. In the following the three strategic goals: “*efficiency improvement*”, “*increased innovation*” and “*risk optimization*” will be discussed.

The main focus at ***efficiency improvement*** is to reduce the costs in the existing business processes quicker than the competitors. On company level, it is about achieving higher efficiency by increasing the value of the output compared to the costs of the input. For many companies one of the biggest challenges is to improve their business processes and then transfer them to other parts of the company (von Krogh et al., 1999). *Texas Instruments* was in the beginning of the 90’s confronted with the problem of regular delays at delivering its

³ One can think of the knowledge required to ski, swim or play the violin.

products. In order to solve this problem, a project was established to search for best practices inside the company. Through the transfer of these best practices between the various units of the company, it was possible not only to minimize delays, but also to reduce the delivery costs (O'Dell; Grayson, 1998). Increased efficiency in operation can also mean improving the speed of processes, getting the “right” types and amount of processes, having improved decision making and increased responsiveness to customers. It is also essential in this respect to learn from partners, competitors and oneself how to manage the business processes more efficiently.

The goal of **risk optimization** concerns mainly risk associated with investments and the running business. Many companies face at least two main risks: (1) political risk and (2) competitive risk (von Krogh et al., 1999). The *political risk* is a result of uncertainty regarding political decisions. Especially for international companies, this can present a big challenge, since national governments can often take unexpected decisions, which cannot be influenced by the company. Competitive risks depend on the uncertainty surrounding the actions and reactions of existing competitors as well as the emergence of new competitors. Since many companies operate in more than one market and because of the erosion of the boundaries of these markets, it becomes increasingly difficult to anticipate such changes. In order to reduce its competitive risks, the German company *Aerospace* created a program for simulating possible scenarios for future environmental conditions in its core businesses. The managers in the company can learn this way to see and understand the complexity and interplay of environmental conditions that can have an effect on their business (Schüppel, 1996). Thus, new knowledge about alternative future scenarios and the functions in the competitive environment is created, reducing the competitive risk of the company. Other risks a company might face are:

(1) Information risk, which is the risk of not having the correct information at the right place at the right time. (2) Knowledge risk, which is the risk of employees exhibiting knowledge deficiencies. (3) Financial risk, which is the risk of the business not managing its finances appropriately. (4) Human risk, which is the risk that the business does not employ the right people for the tasks and that the people with valuable knowledge leave. (5) Derived demand risk, which is the risk that the business either misunderstands or ignores potentially profitable new technologies, or does not engage in sufficient innovation to offset future competition. (6) Communications risk, which is the risk that the business does not communicate its accomplishments to the market and to the other stakeholders. (7) Customer risk, which is the risk that customers are not correctly managed, that customer satisfaction decreases thereby resulting in lower repeat business and referred business. (8) Structural risk, which is the risk that the business cannot support current management initiatives due to a deficient structure.

(9) Resource risk, which is the risk of not having the resources to implement your strategy. Managing the companies risk exposure can also mean capturing the knowledge of experts before retirement, avoiding over-taxing local resources by transferring key personnel on demand and learning from your projects in order to avoid repeated mistakes.

Increased innovation is about improving ones competitive position, through the development of product-, service- and process-innovations (von Krogh et al., 1999). Innovations are mostly based on procedural knowledge and cultural conditions, which cannot be imitated directly by the competitors. Procedural knowledge is knowledge that has something to do with the generic innovation processes. Such a process consists of different phases, like concept development, evaluation and selection of alternatives or developing prototypes (Nonaka; Takeuchi, 1995). Cultural conditions encompass shared values and modes of behavior within the company (von Krogh et al., 1998). For bigger companies with many business units, there is the challenge of leveraging their procedural knowledge in developing different innovations throughout the company, thus achieving a sustainable competitive advantage. Ultimately innovation is about creating new sources of revenues through new products and services. In the long run companies ought to develop a culture that advances innovation. At *DaimlerChrysler* for example, innovations have the highest priority. Andreas Wiechmann, Innovation manager at DaimlerChrysler describes this as follows „Our company culture gives space for creativity and fosters entrepreneurship and initiative. The innovation culture serves the development of many different products within a short period of time“ (Widmer, 1999). Following the discussion of the strategic business goals, we will now turn our focus to the central knowledge processes and the evolution of knowledge management. For innovation it is essential to capture new business process and innovation ideas throughout the companies, to adapt a new product or marketing instrument to another part of the company and to create in depth knowledge to develop radical innovation and process improvements.

Measuring the business goals

Performance measures should have a certain set of characteristics. It is very important to have *cause and effect relationships*. Every measure selected should be part of a chain of cause and effect relationships that represent the strategy. It is also very important to identify the *performance drivers*. Measures common to most companies within an industry are known as “lag indicators”. Examples include market share or customer retention. The drivers of performance (“lead indicators”) tend to be unique because they reflect what is different about the strategy. A good measurement system should have a mix of lead and lag indicators.

Performance indicators help determine *how* something is achieved, and should be particular, context-dependent measurements, self defined by the networks. They should also be simple, understandable and use existing systems and processes rather than introducing artificiality or unnecessary complexity. They furthermore create a language for a shared understanding of local activities throughout the company, which is very important. A challenge, that has to be dealt with is that they also influence and shape behavior. Finally the measures should be *linked to financials*. With the proliferation of change programs underway in most organizations today, it is easy to become preoccupied with a goal such as quality, customer satisfaction or innovation. While these goals are frequently strategic, they also must translate into measures that are ultimately linked to financial indicators. Still, with performance indicators for intellectual capital, *direction* is more important than precision, since essentially *approximations* are valued.

In order to have a successful measurement system, one should follow certain steps. Firstly, it is important to develop a greater *awareness and understanding* of the role of knowledge and the nature of intellectual capital. Secondly, the creation of a *common language* that is more widely diffused within their company is necessary, e.g. using terms such as “human capital”. In addition to this, it is essential to identify *indicators* that are suitable and appropriate and to develop a *measurement model*, that brings these indicators into a coherent framework. Finally, one should introduce *measurement systems*, including the accompanying management processes that guide and reward managers and maybe use objective impartial consultants and surveys to carry out key aspects of the measurement process.

3.3 Identifying knowledge processes

Knowledge is never idle. It flows continuously from activity to activity, from person to person, from task to task and from system to system. The consequent learning is a process in which we increase our ability to act (von Krogh et al., 1999). Starting from this observation, the need arises to analyze the various knowledge processes. Although these processes are often strongly linked to each other and influence each other as well, it has been proven to be helpful to create generic categories of these knowledge processes. Firstly, it is possible to divide knowledge management in logical phases of evolution through these categories. Secondly, these categories help management to identify knowledge barriers and develop knowledge enhancing measures. The knowledge processes can be classified into three categories: (1) Localizing and Capturing, (2) Sharing and Transferring (3) Creating (von Krogh et al., 1999).

At the phase of **localizing and capturing** knowledge the focus lies on finding and charting of already existing knowledge in the company. This is a big challenge especially for companies that have a widely dispersed knowledge base. In these companies it is quite often the case, that business units encounter problems that have already been solved by another part of the company, yet they don't know that, and are thus forced to reinvent the wheel again. Localizing and capturing the existing knowledge is helping the people to find answers to their concrete problems. Consequently, a professional knowledge management must create transparency in the existing knowledge base of the company. Because of the enormous development of ICT technologies, there are many possibilities to support knowledge identification. Many companies have developed "Knowledge Maps" and "Yellow pages", which reduce search costs dramatically. This is especially helpful in big diversified companies, where experts can be localized in spite of geographical dispersion. These search systems have the disadvantage that they can mostly concentrate on explicit knowledge alone, and are unable to capture implicit knowledge. This can in most cases be externalized only by the bearer of this knowledge.

Knowledge **sharing and transferring** refers to the leveraging of existing knowledge in groups, teams, divisions and business units in order to generate value for the company. *Explicit knowledge* can often be easily transferred through electronic media or other forms of documents like manuals and handbooks. Sharing *implicit knowledge* is more difficult, since the direct interaction of the people inside the organization plays a big role (Brown; Duguid, 1991; Leonard; Sensiper, 1998; von Krogh; Köhne, 1998 and Leonard, 1995). Knowledge can be in stories, actions, metaphors, analogies, behavior or visions. Technical infrastructures, which can support knowledge sharing and transferring are for example GroupWare and other modern forms of interactive management information systems.

The process of Knowledge **creation**, is concerned with the development of new explicit or implicit knowledge, by groups or individuals which does not already exist in the company. New knowledge can be created either through the expansion of already existing implicit or explicit knowledge or through a new way of combining these forms of knowledge. Nonaka (Nonaka, 1991, 1995, 1999) divides the process of knowledge creation into four different sub-processes: (1) Combination, (2) Externalization, (3) Socialization and (4) Internalization.

The evolution of knowledge management

One has to bear in mind, that there are typically three stages of knowledge management development regarding the dominant knowledge processes within the company. According to this, specific actions can be followed. (see *figure 2*).⁴

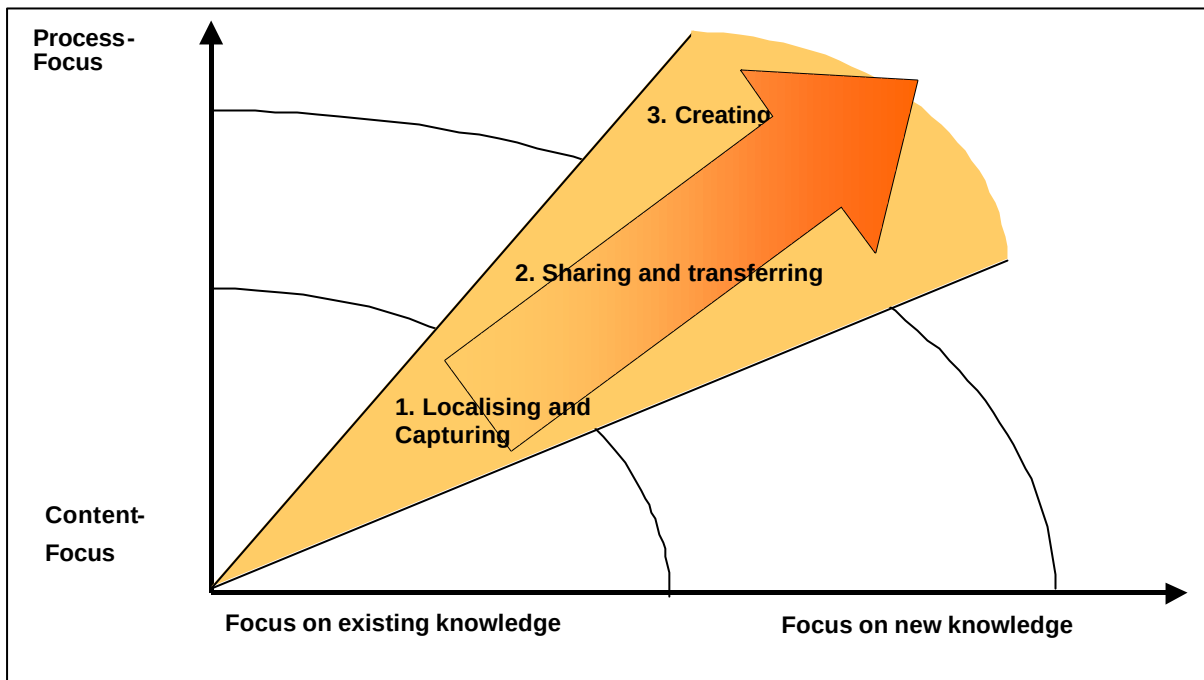


Figure 2: Evolution of Knowledge Management⁵

Most companies concentrate their focus on already existing knowledge within the company. Their main activities in this respect are localizing and capturing the knowledge of the company. After some time, they start to support processes, that help them transfer existing knowledge across organizational divisions and creating completely new knowledge. In this context one could say, that the ability to generate new knowledge will play a central role at achieving competitive advantage, since it is precisely this new knowledge that constitutes a sustainable competitive advantage. Knowledge networks are especially suited for this kind of task. In this way, Knowledge management can support the ongoing knowledge processes within the company.

⁴ The stages of evolution are determined in regard to the investment intensity concerning the relevant activities in each stage.

⁵ Based on von Krogh et al. (2000)

4 CLASSIFICATION OF KNN

4.1 Linking the characteristics of KNN with strategic goals

The reason why the strategic goals were introduced were mainly two. On the one hand, we regard them as essential for developing a clear focus for the activities associated with knowledge networks and for having a clear strategy for knowledge. On the other hand, knowledge networks should be designed or nurtured according to these business goals in order to achieve a higher performance and to be able to measure it.

To identify knowledge networks along their purpose, the characteristics of knowledge networks introduced in Chapter 2 had to be operationalized. Table 4 shows some examples of the measurements we suggest for the characteristics of knowledge networks.

Members	
Specialized skills	Percentage of People with highly specialized skills
Technical Skills	Percentage of people with technical skills
Industry Experience	Percentage of people with over 5 Y experience in industry
Working Experience	Percentage of people with over 5 Y working experience
Task orientation	Amount of time spent with specific tasks as a percent of overall time
Commitment	Percentage of all time spent within the network
Personal power	Percentage of decisions taken by one person (hierarchical model)
Relationship	
Intensity	Time spent communicating within in the network as percentage of overall time
Frequency	amount of communication contacts
Duration	Long-term orientation
Media Richness	Amount of different media used
Use of communication tools	Time spent using communication tools as a % of overall communications
Size of Network	No. of members as a % of company employees
Centralisation	Amount of people with target setting authority
Entry barriers	Membership requirements
Geographical scope	Number of locations involved
Knowledge	
shared common experience	Percentage of time working in the network
shared common practice	Percentage of members who have already worked together

Table 4: Examples for the measurement of knowledge network characteristics

The extension of the characteristics differ depending on the business goals of an organization. While, for example, a high degree of working experience within a risk network is important, within an innovation network this not required to the same extent. The percentage of all time spent within the network, as a measure for the commitment of a person, has to be relatively higher within a innovation network compared to an efficiency network. Moreover the duration of the relationships between the members of a network serving mainly to innovation is more long term oriented compared to that of an efficiency network.

Figure 3. shows the reference knowledge networks for the three business goals efficiency, risk optimization and innovation.

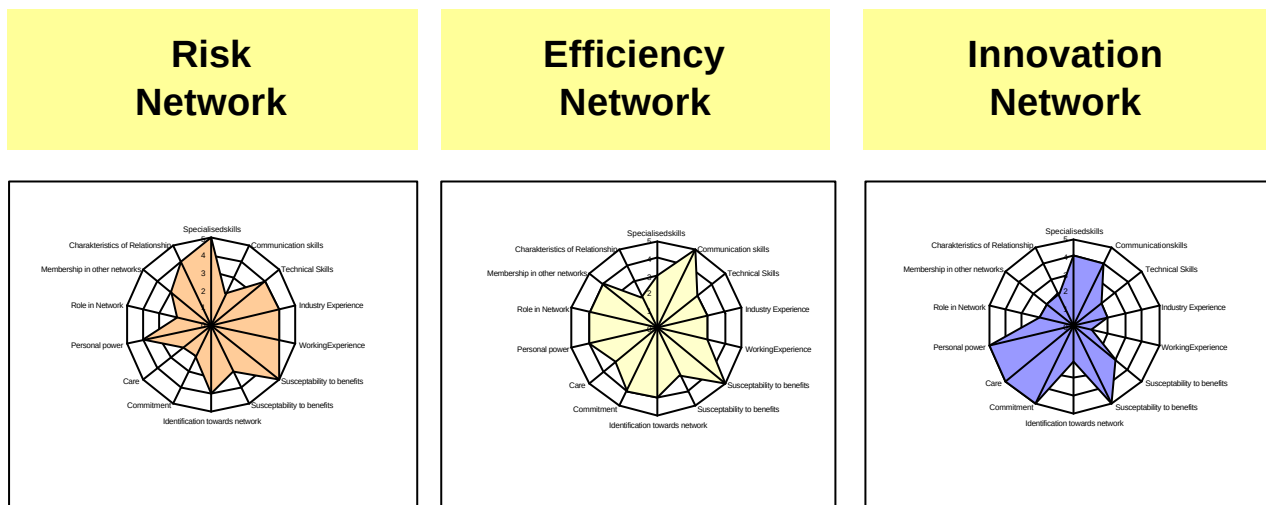


Figure 3: Reference Knowledge Networks

It is important, however, to note here that knowledge networks can also serve multiple goals. Still, if one proposes the deliberate creation of a network for the tackling of a specific goal, then it should serve this one goal only.

4.2 Next Steps

However, the criteria and measurements of ideal risk optimization, efficiency and innovation knowledge networks need to achieve an empirical validity. In order to get a broader basis for the criteria and the measurement of the reference networks, we are aiming to get empirical feedback on the knowledge networks criteria within the Competence Center in a first phase. In a second phase, we aim to do a broader empirical study to identify reference knowledge networks.

Using our model we will then map and compare the resulting knowledge network characteristics with the reference knowledge networks. With our methodology, finally, we are aiming to close the gap, which results from a gap-analysis, between reference and current knowledge networks depending on their purpose.

5 IMPLICATIONS

Derived from the above, there are some implications for theory and practice. First of all, it is important to note that knowledge is essential for the development of sustainable competitive advantage, especially because of the difficulties associated with the imitation of implicit knowledge. In this context, we argued that Knowledge Networks are a powerful concept to link knowledge management to business strategy, through their alignment with the business goals of the company. Moreover, synergies can be achieved inside the company through the localization and transfer of knowledge from the different business units. Since lasting competitive advantages, especially such which are built upon explicit knowledge are of limited duration, it is a central challenge for knowledge management to find new ways of distributing implicit knowledge and creating new knowledge, and hence competitive advantage. This can be achieved through the combination of already existing knowledge components or the leveraging of existing knowledge in other business units. Furthermore a professional knowledge management can work as a catalyst for improving existing knowledge. Also the companies should develop a strategy for dealing with their knowledge in order to align their goals in knowledge management and the usage of knowledge networks with the overriding business goals of the company. Thus networks can be used to achieve innovations, efficiency improvements and risk optimizations. This categorization of networks also enables the measurement of their goal achievement, making it possible to determine whether they are high performing or not. This categorization will also be tested empirically, in order to gain further insights into the links between knowledge management and business strategy. The evolutionary stage of knowledge management in the company should be accounted for in the development of the action plans as well, meaning the implementation of actions associated with the different knowledge work processes.

6 CONCLUSION

This paper addresses the problem of designing and nurturing knowledge networks based on their purpose that is, the business goals of an organization. In the **first chapter** an introduction to the subject is given. The objective of the **second chapter** was to gain a better understanding of our notion of knowledge networks arising from previous research. The characteristics of knowledge networks have been aggregated and clustered along the dimensions relationships, members, and knowledge.

In the beginning of the **third chapter**, we described the role of knowledge and knowledge management. We showed that due to the resource knowledge, especially implicit knowledge, and its difficulty to be imitated or transferred, sustainable competitive advantage can be achieved. It was further argued, that knowledge management is of central importance for every company, because of the achievement of synergies and its role as a catalyst of knowledge. Then we determined the business goals and the possibilities for their measurement. Next, we looked at knowledge working processes. It was argued that the activities promoting the use of knowledge, such as the setting up of knowledge networks, have to be attached to the overall business goals of the company. The goals that were identified in this manner were “*efficiency improvement*”, “*increased innovation*” and “*risk optimization*”. Following that we identified the knowledge work processes *Localizing and Capturing*, *Sharing and Transferring* and *Creating*. Building onto this we showed an evolution of knowledge management next and argued that according to the focus of knowledge management in the different stages, the activities are determined. In the **fourth chapter**, the knowledge network characteristics were linked to the strategic goals. By suggesting that knowledge networks can to a certain extent serve a distinct strategic goal we proposed reference knowledge networks. Those risk, efficiency and innovation networks, however, have to be tested empirically, in order to help with the derivation of solutions for improving the use of knowledge within companies, thus creating sustainable competitive advantages. Finally, some implications for our future development of the framework were discussed.

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