

# CREATING FUTURE CAPABILITIES - SCENARIO PROCESS IN INTER-INDUSTRIAL KNOWLEDGE NETWORKS

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## Session C-4

### Abstract

It is well known that the dynamics in business are changing. Companies need to be aware of changes in their business environment, have an ability to recognize and exploit opportunities through their rare and distinctive resources and capabilities. This depends on their dynamic ability to reinvent their capabilities, business models, and strategies as circumstances ongoing change. This paper studies the framework for sustaining the renewal of core capabilities in an inter-organizational context. Firstly, the dynamic capability view is introduced. Secondly, we examine organizational knowledge creation through communication and learning and explain the basis of future-oriented knowledge. Finally, we present the scenario process to facilitate and manage knowledge creation in an inter-industrial knowledge network case.

**Keywords:** capabilities, knowledge creation, mental models, communication, scenario.

# Creating future capabilities - Scenario process in inter-industrial knowledge networks

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## Abstract

It is well known that the dynamics in business are changing. Companies need to be aware of changes in their business environment, have an ability to recognize and exploit opportunities through their rare and distinctive resources and capabilities. This depends on their dynamic ability to reinvent their capabilities, business models, and strategies as circumstances ongoing change. This paper studies the framework for sustaining the renewal of core capabilities in an inter-organizational context. Firstly, the dynamic capability view is introduced. Secondly, we examine organizational knowledge creation through communication and learning and explain the basis of future-oriented knowledge. Finally, we present the scenario process to facilitate and manage knowledge creation in an inter-industrial knowledge network case.

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**Track:** C (knowledge creation and innovation)

## 1 Introduction

Companies operating in a changing environment face the danger that their core capabilities harden into "core rigidities" (Leonard-Barton, 1992). Core capabilities involve accumulated behaviors and beliefs based on earlier success. Knowledge embedded in routines, processes, techniques and systems is derived from multiple sources over the years. Highly specialized skills tend to become stable which over time leads to a loss of metalearning expertise (Lei et al. 1996). The entire organization may create organizational defensive routines, which are anti-learning and lead to "skilled incompetence" (Argyris, 1999). Organizational actions and organizational cognition reinforce each other: actions are based on individual-level, group-level, and organization-level mental models i.e. mental templates consisting of organized knowledge or representation of the environment (Walsh, 1995). The actions taken reshape mental models. Over time, this self-reinforcing feedback loop narrows the

attention and channels the interest to familiar knowledge sources. If business goes satisfyingly there is a considerable risk of becoming insensitive to changes in the market. If the company's capabilities and knowledge base lose their dynamic quality the company becomes unable to find the flexibility and adaptability needed to respond to environmental changes. The ability to build and integrate new capabilities and reconfigure the existing ones is critical when the operating environment is in a state of flux. To succeed in that, deeply embedded knowledge sets have to be constantly challenged and renewed.

The knowledge-based view of the company or the capability-based approach sees the company essentially as a repository of productive knowledge (Grant, 1996; Kogut & Zander, 1992; Teece et al. 1997). Company's knowledge-based assets are its potential source of competitive advantage. However, when the operating environment changes rapidly also the company's knowledge base has to absorb new knowledge so that the company is able to match its capabilities and products with altered requirements and changing market needs. Due to changes in technologies, consumer preferences, regulations and other market shifts, companies have to reconfigure their capability portfolio continuously. Thus, potential competitive advantage rests on dynamic capabilities referring to the company's processes enabling the adaptation to the changing environment. Company's dynamic capabilities are the ability to build, reconfigure and renew resources, capabilities and routines in a changing business environment (Teece et al. 1997). The development of capabilities calls for well-organized knowledge-searching and acquisition procedures. Company's capabilities are developed through learning processes and the integration of routines. According to Zollo and Winter (2002), company's dynamic capabilities reflect its tacit experience accumulation processes and explicit knowledge articulation and codification activities.

Feurer and Chaharbach (1995) argue that essential to an organization is the quality of knowledge that captures dynamics and uncertainties of the future environment. They continue that the quality of knowledge means flexible, creative, and future-oriented knowledge creation process. To make organizational knowledge creation in inter-organizational context possible, the process need to be facilitated and managed in a structured way (e.g. Chesbrough & Teece, 1996; Gupta & Govindarajan, 2000; Inkpen, 1996; Nonaka et al. 2000; von Krogh et al. 2001; Wiig, 1999). Von Krogh (1998) also reminds that knowledge creation in organizations is a fragile process which needs careful consideration and the establishment of enabling conditions. In the scenario

process, the relevant accumulated experience of participants is articulated and, to some extent, codified. The issue under scenario examination channels the knowledge articulation process. Hence, the scenario process is one method that can be used deliberately to question established ways of thinking and to support organizational learning.

## **2 Organizational knowledge**

Organizational knowledge creation concerns interaction between tacit and explicit knowledge that develop in a complex web of relationships and social activities among individuals. Nonaka and Takeuchi (1995) define explicit knowledge as knowledge that can be expressed in formal, systematic language and shared in a form of data, and also concerning past events, whereas, tacit knowledge concerns present “here-and-now” knowledge which is available in direct experiences in discussions, routines, values and emotions. Nonaka and Takeuchi (1995) state that both types of knowledge are complementary and essential to knowledge creation. But to create sustainable competitive advantage, organizations should make sense of the changing environment and create future-oriented “not-yet-embodied” knowledge (Kulkki & Kosonen, 2001; Millet, 2003; Scharmer, 2001; Schoemaker, 2000; Schwartz, 1996; Teece et al. 1997; van der Heijden et al. 2002).

Bell (1997) has stated some fundamental assumptions for future studies: First, something currently nonexistent can exist in the future. Second, there is no certain information about the future, thus future cannot be observed. He continues that the future is not predetermined because future outcomes can be influenced by proactive measures. Future outcomes are consequences of some actions of certain actors based on knowledge created from information about the environment. Ingvar (1985) has noted that all human acts are based on future-oriented plans/scenarios which he calls “memories of future”. In other words, future-oriented knowledge concerns expert or/and actor knowledge, beliefs and intuition about the development of the issue and its conjectures (Aligica, 2003; Johannessen et al. 1999; Kulkki & Kosonen, 2001; Scharmer, 2001). Also Nonaka et al. (2000) and von Krogh et al. (1998; 2001) mention the proactive knowledge creation around the self-transcending tacit knowledge reaching beyond personal boundaries. Bennett (1998) and van der Heijden et al. (2002) argue that tacit knowledge gathered through years’ experience in a form of intuition makes it possible to develop new interpretations of environmental causalities concerning the

future. Future-oriented “not-yet-embodied” knowledge enables the challenging of the present organizational-level mental models and a better understanding of the complexities of the emerging internal and external environment (Schoemaker, 1991) and becomes  $\emptyset$  prior knowledge to confront the uncertain but (now) known environment. The future-oriented knowledge can be seen, as Cohen and Levinthal (1990) state, as prior knowledge that enables the assimilation and the use of new knowledge, in this case, emerging in the future.

### **3 Inter-organizational knowledge creation**

Knowledge creation in organizational level depends strongly on individuals organized together to share their personal knowledge and to learn from other persons' knowledge (Ford & Chan, 2003). In other words, knowledge is created in a dynamic social interaction amongst individuals, organizations, and the environment (Nonaka et al. 2000). Bergquist et al. (2001) have noted that knowledge creation is a collective process of understanding the surrounding environment. In the organizational level, knowledge creation is related to working communities in which individuals are able to act through direct experiences (Inkpen, 1996; Nonaka & Toyama, 2003; von Krogh et al. 2001). In the working communities, individuals with different backgrounds, experiences, and mental models are bound together to share and create knowledge for organizational purposes (Inkpen, 1996; Leonard, 1998; Malone, 2003). Working communities provide a physical context for the knowledge creation process (Leonard, 1998; Nonaka & Toyama, 2003) where knowledge creation starts at the individual level, goes through the conversion within the group level and finally accumulates into the organizational level as a continuous process (Inkpen, 1996). Interaction between individuals is not limited to a particular working community but is linked to the environment and other communities across organizational boundaries (Nonaka & Toyama, 2003). These interactive linkages enable the transfer of knowledge between individuals and different organizations and the creation of interpretation of internal and external environment for the basis of new knowledge (Nonaka & Toyama, 2003). Interaction between individuals and the organization, and individuals and the environment expands the knowledge creation context into an inter-organizational network structure and holds them together in a form of network (Debackere et al. 1994; Weick & Browning, 1986). Knowledge creative networks in organizations provide the means of coping with complexity through individuals and groups (Kash & Rycroft, 2002). Kash and Rycroft (2002) continue that knowledge networks are formed to create new knowledge for renewal of organizational

capabilities to provide new insights in technological and market development for new innovations, and to ensure long-term efficiency within the organization.

Organizational communication, based on interaction between individuals sharing their personal knowledge, connects individuals with the community, thus, making them more involved in the community over time (Debackere et al. 1994). The purpose of such communities is to ensure the collaboration of professionals and the creation of specific knowledge for problem-solving (von Krogh et al. 2001). As communities involve a number of individuals from different organizations working on the same task under a shared vision they have access to a wider organizational knowledge base, the connections become more interactive, and more holistic interpretations are formed (Daft & Weick, 1984; Inkpen, 1996; Malone, 2003; Weick, 1987). In these working communities and among individuals with different organizational experiences and cultures, knowledge bases increase divergent thinking in a dialectic process which drives the creation of innovative new ideas and new knowledge (Bennett III, 1998; Leonard, 1998). Weick (1991) also defines knowledge creation in an organizational learning process as a result of groups of individuals creating collective interpretations. Kash and Rycroft (2002) stress that the networking communities' particular strength is the capability to assess tacit knowledge and combine it with explicit knowledge.

Nonaka et al. (1995; 2003) present the framework for knowledge-creation process as dialectic thinking and acting in a shared context. Different intra- and inter-organizational working communities offer a context where creative social interaction can take place and a dialogue occurs between tacit and explicit knowledge inducing new knowledge (Nonaka et al. 2000). According to Nonaka and Takeuchi (1995), the organizational knowledge creation process consists of four main phases: *Socialization* is a process of sharing experiences, i.e. tacit knowledge meaning that knowledge has to be shared, made conscious and articulated. *Externalization* is a process of transforming tacit knowledge into an explicit form through deeper articulation integrating different perspectives of knowledge. *Combination* is a process of integrating newly created and existing explicit knowledge and transferring it into a system. Finally, *internalization* processes explicit knowledge into tacit knowledge through experiences where individuals absorb explicit knowledge e.g. through learning by doing. The knowledge creation process is a continuous and cumulative process in which accumulated prior knowledge increases the ability to gain more knowledge and learn subsequent concepts more easily (Bhatt, 2000).

#### **4 Barriers and enabling conditions in communication and collaborative knowledge creation**

Communication has a central role in the knowledge creation process, and it can be defined as a dialectic process; it is subjective, perceptual, nonverbal as well as verbal, and general or contextual, rather than specific (Goldhaber et al. 1979). In the organizational context, communication can be seen as “the exchange of information between a sender and a receiver and the inference of meaning between organizational participants” (O’Reilly & Pondy, 1979). In this paper, we emphasize the sociological perspective of communication; to overcome individual cognitive limits, knowledge must be shared through a process of socialization with the need for collaborative knowledge creation also with players outside the direct control of the company (Sawhney & Prandelli, 2000).

According to von Krogh (1998: 135), “when we create new knowledge we make sense out of a new situation by holding justified beliefs, committing ourselves to this new situation, and, most importantly, by enhancing our potential to act in a new situation.” The first steps in knowledge creation hinge on individuals being able to share and justify their personal true beliefs about a situation publicly with other team members. Von Krogh (1998) has found four barriers to public justification processes in sharing personal knowledge. *The first* one is the need for a legitimate language and vocabulary meaning that language should be known and acceptable to all team members and to the company. *The second* barrier is constituted by organizational stories and habits that are based on history, or routines that are difficult or impossible to question. *The third* barrier are formal procedures representing embedded experiences and successful solutions to complete tasks. These core capabilities may lead to “core rigidities” (Leonard-Barton, 1992) if they work against public justification of individual beliefs in directing communication and defining planning steps. *The fourth* and the most fundamental barrier are company paradigms which include its strategic intent, vision or mission statement, strategies, and core values. For political and cultural reasons, individuals will find it difficult to justify personal beliefs that are not in accordance with the ruling paradigm.

Organizational structure can also constitute an enabling or preventing environment for knowledge sharing and communication. Structure refers to the network of relationships

and roles existing throughout the organization. Due to their extreme formality or cumbersome size and complexity, some structures act as communication blocks, filtering and distorting potentially useful information, whereas, more informal structures tend to allow more information to flow across its network paths than people can handle leading to overload. The major communication implication of structure, then, is what kind of structure is most suitable for present organizational needs so that important information flows freely without overloading relevant decision-makers (Goldhaber et al. 1976).

According to Miller (1999), communication in bureaucracies takes on specific characteristics. The content of communication is normally task-related and discourages social communication and innovation. The direction of communication will typically be routed up and down the organization chart, and horizontal communication will only be encouraged among employees of the same level. The content will typically be in the form of orders, rules and directives, and will result in little feedback. The written mode of communication will be most prevalent and will focus on rules and procedures for efficient organizational functioning. The style of communication will probably be formal and even when managers ask for employee input it is likely that these managers will not act on employees' opinions. Thus, bureaucratic structure seldom leads to active knowledge sharing and creation.

According to Nonaka & Takeuchi (1995), the role of the organization in the organizational knowledge-creation process is to provide a proper context for facilitating group activities as well as the creation and accumulation of knowledge at the individual level. As for the process function, knowledge managers can lead and facilitate knowledge creation, accumulation and sharing of tacit knowledge activities by socially nurturing a "good" *ba* for converting individual knowledge into organizational knowledge (Nonaka & Konno, 1998). The enabling condition for communication and knowledge creation is a dynamic, open knowledge environment which generates the ability for organizational self-renewal and radical innovativeness (Stähle & Grönroos, 2000).

Sawhney and Prandelli (2000) introduced a governance mechanism called a community of creation for managing distributed innovation, and challenging cognitive limits. The model is based on the concept of *ba*. Participating in a *ba* (physical, virtual, mental environment or any combination of them) means transcending one's own limited perspective or boundary and contributing to a dynamic process of knowledge

development and sharing. In order for a community of creation to develop, it requires e.g. a common interest, a sense of belonging, an explicit economic purpose, a sponsor, a shared language, ground rules for participation, and co-operation as the key factors for success.

The scenario process can be seen as an application of community of creation where “explicit knowledge as well as tacit knowledge can be shared because participants build up a common context of experience, allowing them to socialize knowledge developed in specific contexts” (Sawhney & Prandelli, 2000). The scenario process offers a structured and facilitated context for participants to gain and create new future-oriented knowledge in a collaborative manner. It affords an opportunity to challenge present mental models and to create new interpretations about the future business environment and technological development.

## **5 Reconstructing mental models**

According to Argyris (1999), learning is defined as occurring under two conditions: first, when organization achieves the goal what it intended, and second, when mismatch between intentions and outcomes is identified and corrected. This process of error detection and correction is interesting in the view of reconstructing mental models. When an error is corrected without questioning the underlying values of the system the learning is called single-loop learning. This can be symbolized by a thermostat controlling the temperature in a room. When the error is corrected by changing governing variables or preferred states that persons reach for, and then changing their actions, the process is called double-loop learning. Double-loop learning is more relevant for complex and non-predictable issues, and it emphasizes the future aspect of organization. In this paper, learning will be interpreted as double-loop, and in short, it can be defined as the detection and correction of errors (Argyris, 2002).

In a learning process the role of an individual is essential due to a fact that organizations do not perform actions producing learning. Organizations learn only through individuals acting as organizational agents producing behavior that leads to learning. The process presumes that individuals recognize useful data and information, and are then able to transform it, through some process, into knowledge that brings future value for the organization (Senge, 1990; Argyris, 1999; Storey & Kelly, 2002). Understandably, organizations have a possibility to create conditions that may influence what individuals

frame as a problem, design a solution and produce action to solve a problem (Argyris, 1999). The concept of collaborative learning also holds a major role in the scenario process due to the fact that collaborative learning in organizations can foster knowledge creation. As Dove (1999) has found out, collaborative learning supported by a purposeful infrastructure and culture causes more diversity of thought into closer knowledge exchange.

The concept of the mental model is not a new one, and it was firstly cited in the 40's (Spicer, 1998). These models are personal, subjective descriptions of situations formulated in abstract terms, and these models are simplifying stimuli and data on the environment. Mental models also exist below an individual's level of awareness (Senge, 1992; 1994; Spicer, 1998). There have been several studies on the importance of the subject, but only from the beginning of the last decade the extraction of mental models has been recognized as a crucial function in learning (Van der Heijden, 1992; Bood & Postma, 1997).

Scenarios have been recognized as a way to enlarge mental models by confronting managers with their own biased viewpoints (Wack, 1985a). As Spicer (1998) has stated, mental models are built and developed during a lifetime and these models are shaped by experience, the social and cultural background and education. The role of the mental model is crucial in learning: at the individual level, these determine what kind of data is collected, which methods are used in analyzing them and how the outcomes of the analyses are interpreted. These can be developed or extracted by gaining experience and learning from it. Also, the terms assimilation and accommodation are essential in extracting managers' mental models. Assimilation is the process in which people impose their own mental models on the environment. Accommodation is the other side of the coin: people adapt their mental models to the world they live in. (Bood & Postma, 1997). It is also known that people do not easily change or elicit their mental models. But when they do they usually assimilate and accommodate at the same time.

Due to a fact that every person has a special mental model, there is always a kind of mixture of models in the scenario group. The right balance in the variance in mental models can be a great advantage in the scenario process. When a scenario group can form a large potential coverage of mental models participants of the scenario process look from different perspectives the future and the environment, bring different views for the work and people with different views communicating with each other stimulates

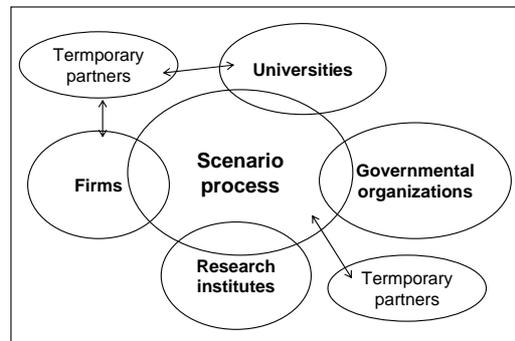
creativity (De Bono, 1987, ref. Bood & Postma, 1997). It is also worth remembering, that the key for success is the right balance of different kinds of mental maps. If the maps differ too much or are too identical, there are risks especially in the form of groupthink (Eaton, 2001) undermining or paralysing the effective strategic learning process.

Therefore, mental models have to be the primary focus in the scenario analysis remembering that scenarios may facilitate communication and elicit managers' mental maps.

## **6 Scenario process in inter-organizational knowledge networks**

The process of creating new knowledge presumes that individuals recognize useful data and information and are then able to transform it, through some process, into knowledge that brings future value for the organization (Senge, 1990). According to Schwartz (1996), the scenario process makes it possible to share and reassemble personal knowledge to build a holistic understanding between the internal and external environment in an organization. It works as a facilitated and structured context enabling individuals to be as an intermediate (or interface) in interaction between the internal and external environment (Cohen & Levinthal, 1990; Kulkki & Kosonen, 2001). The scenario process helps to understand a wide variety of unstructured, complex, and contradictory knowledge that has both tacit and explicit dimensions. The scenarios drawn through different personal experiences and perspectives have a multidisciplinary and multidimensional character, help organizations and individuals to develop and broaden mental models of possible future realities, and understand the fundamental drivers of business, market and technological trends and changes (Masini & Vasquez, 2003; Schoemaker, 1991; 1992; 1993; Teece, 1998; Wack, 1985b). Scenarios provide a method for comparing company-specific capabilities with future needs, and enable decision-making in situations of complex rapid social change (Schoemaker, 1992). According to van der Heijden et al. (2000), the ultimate goal of the scenario process is to achieve adaptive learning skills through the organization. Scenarios make individuals' implicit assumptions about the future explicit stimulating strategic thinking and communication, and they improve flexibility of response to environmental uncertainty (e.g. Godet & Roubelat, 1996; Schwartz, 1996; van der Heijden et al. 2002; Wack, 1985a). Wack (1985b) continues that scenarios make it possible to challenge present assumptions and mental models. In this sense, scenarios can be seen as a

communication tool encouraging to change personal experiences in a social context, and learn from it.



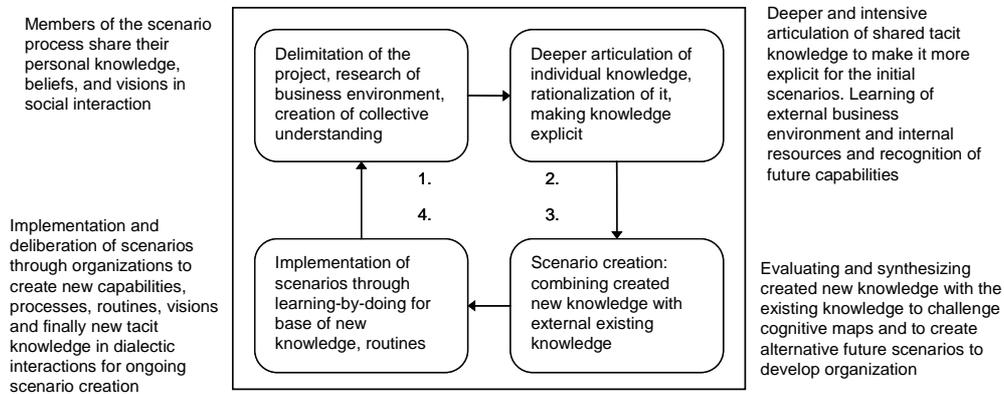
**Fig. 1.** Knowledge sharing network as a dynamic shared context of the scenario process

According to Grant (2003), organizations need to have channels and forums for communication and knowledge sharing, and they should be capable to promote a dialog inside an organization and between an organization and the environment. In terms of Nonaka et al. (2000; 2003), to create new meanings through interaction participants in a social communication process need to have a shared physical context i.e. the “*ba*”. The scenario process involves organizational leaders and managers, R&D centres, associations, different groups of experts and many other stakeholders in the form of a structured and facilitated network to share knowledge and to create alternative interpretations of the future on the basis of shared knowledge (Fig. 1) (Roubelat, 2000). It provides a framework for creative discussion in a shared context about alternative views emerging inside and outside an organization (Schoemaker, 1993) and becomes a process enabling the group to create representations on the basis of shared knowledge (Roubelat, 2000). In this sense, the scenario process can be seen as a social construction of knowledge incorporating social and cognitive perspectives (Akgun et al. 2003).

## 6.1 Creating scenarios

According to Masini and Vasquez (2003), creating scenarios means carrying out an ongoing cumulative process. The scenario process helps to create an interactive and structured social environment for an organizational communication process. It has a certain structure and phases common to all approaches (e.g. Godet, 1993; Masini & Vasquez, 2003; Schoemaker, 1993; Schwartz, 1996; van der Heijden et al. 2002). According to Phelps et al. (2001), the scenario process can be conceptualized into four

stages: starting from the delimitation of the focus to interactive knowledge sharing and creation, and from resulting combinations of new knowledge in the form of scenarios to organizational learning through the implementation of the scenarios.



**Fig. 2.** Scenario process and continuous knowledge creation.

The scenario process starts (Fig. 2) with organizing a working group from participating organizations which connects the organizations into a form of knowledge sharing network (Fig. 1.) (Roubelat, 2000). A working group in the scenario process serves as a shared context where individuals from participating organizations may act through direct experiences (Nonaka et al. 2000). A working group consists of experts, actors and other stakeholders with multidisciplinary backgrounds who reflect upon the futures of a network and whose knowledge is useful concerning the issue (e.g. Kuusi, 1999; Schwartz, 1996; van der Heijden et al.2002; von Krogh et al. 2001). In the working group meetings participants identify the knowledge gap between the network and the environment and between the individuals through direct interaction creating shared collective tacit knowledge for the basis of the scenario process and knowledge creation. A working group creates a common language and practicalities for the process and sets a goal around a loose vision. According to Nonaka et al. (2000) and Godet (2000), the actions of an organization need a direction.

A working group continues articulating shared knowledge in intensive discussions, seminars, and face-to-face meetings. The working group identifies the past and present patterns, trends and changes around the issue, and it may be expanded temporarily to bring new knowledge and insight into the process by inviting e.g. economist, social and cultural specialists, technological experts etc. They may also conduct surveys or Delphi panels to assess wider opinions (van der Heijden et al. 2002; von Krogh et al. 2001). This phase provides an understanding of the causalities in the environment and

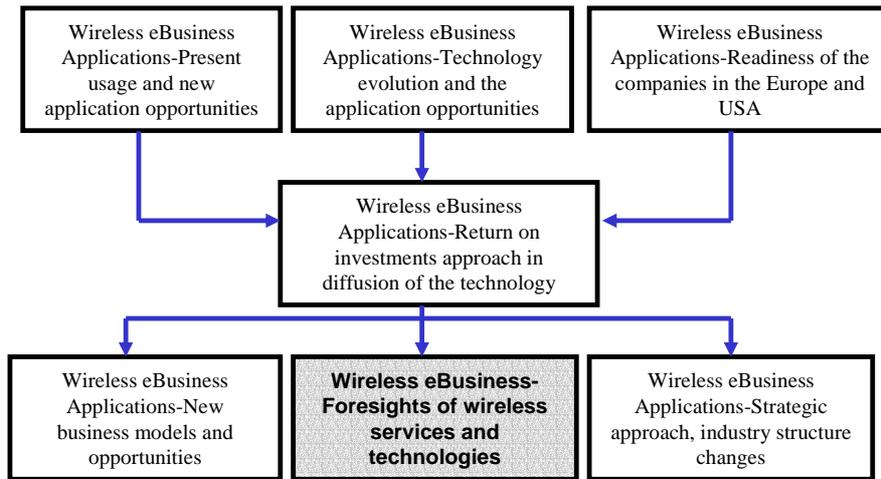
connects organizations to it. The environmental driving forces and their backgrounds are assessed, stakeholders of the issue are identified, and the required capabilities for the future are analysed. The initial scenarios make the tacit knowledge of the working group explicit.

When new knowledge is created during the intensive communication among the participants of the process and made explicit (initial scenarios), the scenario creation continues by integrating the existing explicit organizational or collected external knowledge (predetermined elements, business regularities, technology trajectories, organizational capabilities etc.) into created new knowledge (Nonaka & Toyama, 2003; Schoemaker, 1992). The final alternative scenarios are created through evaluation and combination of gathered knowledge during the preceding phases. The scenarios reflect the beliefs and intuition of the knowledge network concerning the future. They are shared collective representations of the possible developments in the organization's progress and environment (Roubelat, 2000; Wack, 1985b). Scenarios make it possible to assess organizational capabilities in a new light, leading organizations to action and decisions (Godet, 2000).

Final phase in the scenario process is an implementation of the scenarios. Scenarios are disseminated and implemented into the organization through communication. According to Millet (2003), scenarios work for investment and organizational decision-making e.g. R&D priorities, new products, financial investments, and provide a context for the long-term strategic planning. Scenarios make it possible to evaluate organizational capabilities against the future needs and to develop them (Mason, 2003; Schoemaker, 1992). Furthermore, they serve as a platform for the evaluation of new innovations and business ideas to clarify their success and market potentials. The scenario process stimulates thinking and challenges present routines and mental models, and leads to continuous and cumulative knowledge creation and learning process (Masini & Vasquez, 2003; van der Heijden et al. 2002). As a communication tool, scenarios diffuse explicit future-oriented knowledge throughout the organization and become the basis for new scenarios.

## **7 Case: Scenario process in inter-industrial knowledge network: examining new business opportunities in the field of wireless communication technology**

### **7.1 Background of the research project**



**Fig. 3.** The phases of the research project “Wireless e-Business” (Laaksonen, 2001).

This section introduces the scenario process in a research project for knowledge management in an inter-industrial knowledge network. The scenario process was part of a larger research project aiming at better understanding of the management of the corporate strategy process and providing foresights for the industry. The research project consisted of seven separate phases (Fig. 3). The first four phases provided background knowledge for the phase “Foresights of wireless technology” in which the scenario process was conducted to manage the creation of new knowledge on the basis of explicit and tacit knowledge gathered during the preceding phases of the research project, and facilitate interaction between the participants in the research project. During the scenario process, new knowledge about the future business opportunities of wireless technology was created, new requirements for future capabilities were identified, and learning within the collaborative network was facilitated. The participants in the research project were two leading global pulp & paper companies, StoraEnso and UPM Kymmene, international telecom company TeliaSonera, the SME software company Modultek, the National Technology Agency of Finland, and the Telecom Business Research Center at Lappeenranta University of Technology (TBRC). The research project started in April 2001 and continued for two years, with the TBRC being in charge of the management and facilitation of the research project.

## 7.2 Description of the scenario process in the research project

The scenario process started in the summer of 2002 and continued for one and a half years. A multi-disciplinary collaborative knowledge network was formed between the

participants of the research project from two different industries to build alternative future scenarios. The knowledge network consisted of ten researchers in the TBRC and five permanent representatives from the participating companies. This knowledge network acted as a knowledge creating working group in the scenario process.

From the beginning of the research project the scenario process enabled a dialectic communication process and knowledge creation and management in the knowledge network. The scenario process was based on social interaction between the participants in the working group during which group and person-to-person meetings were conducted periodically. In these meetings the participants in the knowledge network shared their personal and gathered additional information and knowledge. The researchers shared the gained and analysed project-specific knowledge with the company representatives who contributed to the process, sharing the existing company-specific tacit and explicit knowledge. The participants also communicated informally in face-to-face meetings in the participating companies and via telecommunication devices to complement the knowledge base. During this first phase, participants in the knowledge network held an intensive working group meeting to analyse the knowledge gap between the companies and the environment resulting in an overall focus of the scenarios process around the shared loose vision “new business opportunities for wireless communication technologies”. The overall goal of the scenario process reflected the focus of the research project. The preliminary targets were to identify future capabilities and business opportunities to sustain companies’ long-term business operations, and also to enhance inter-industrial collaboration in business.

*In the second phase*, the participants continued the articulation of shared tacit knowledge. They held periodical working group meetings once a month, and the researchers had intensive brainstorming sessions at least once a week. These enabled a deeper articulation and externalization of the tacit knowledge of the knowledge network and integration with the existing company-specific tacit knowledge and the background information from the preceding phases of the project. The process produced a collective understanding about the dynamics of the industry and technology, e.g. the driving forces, the stakeholders and the main actors in the business environment, current trends, best practices of the ICT industry, as well as existing organizational knowledge concerning the issue. The created collective tacit knowledge was used for background information and knowledge in the scenario building. This knowledge was based on deep examination of the development of wireless technology and appliances,

and investigation of new business models in close cooperation with the participating companies. During this collaborative research work, the companies had excellent opportunities to share their company-specific knowledge and experiences with the knowledge network and gain new knowledge and insights for their own use. This phase resulted in a common understanding of the future requirements for the industry. The present and future industry capabilities were identified and comparison with the best practices of the industry was performed. A holistic collective understanding of the issue was attained in the form of initial scenarios for further and more systematic processing.

*After the second phase*, the researchers formed a smaller “scenario team” to communicate and share their externalized knowledge on the knowledge network and to combine it with the existing explicit knowledge gathered in the previous phase. During this phase, the scenario team examined intensively the gathered background information and the created new knowledge. They had daily scenario sessions to share their ideas, information and knowledge to produce collective representations, in other words, to combine the created new knowledge and the existing explicit knowledge. These representations i.e. preliminary scenarios were presented in periodic meetings where company representatives had an opportunity to contribute to the scenario process and share their knowledge, beliefs and visions within the knowledge network.

For the creation of final scenarios, the knowledge network was extended in the participating companies. A web-survey was conducted to collect additional knowledge from the experts in the companies. A questionnaire was used in which experts were asked to evaluate the most important drivers for the future wireless business environment. The drivers (altogether over 300) were selected in scenario sessions and periodic meetings. The final questionnaire included 79 arguments selected by the scenario team. The web-survey was sent to 60 selected experts in the participating companies 46 of whom returned their answers. On the basis of the web-survey and the created new explicit knowledge, alternative future scenarios were created and articulated in the final knowledge network meeting (combination) before implementation in the participating companies. During the network meeting the future business opportunities were analysed and the required capabilities for them were compared with the existing company-specific resources and capabilities.

*The final step in the scenario process* was the implementation of the alternative scenarios in the participating companies in their operations. The scenario process was

an excellent opportunity for the companies to challenge their present mental models and create new interpretations of the business environment and technology development. This phase enabled the internalization of the created explicit knowledge during the scenario process and the development of new capabilities through learning by doing. Scenarios made it possible to assess present practices and R&D investments, and even provided knowledge for  $\emptyset$  strategy planning. In other words, the scenario process made it possible to keep alive the continuous spiral of knowledge creation and diffusion of knowledge in a corporate network during the research project. The scenario-based knowledge creation and sharing process gave an initiation to act and gain new knowledge in a structured and facilitated way in collaborative inter-industrial relationships and to serve as the basis for continuous knowledge creation.

## **8 Discussion**

Hamel and Välikangas (2003) argue that the resilience of a company is an ability to improve organization's capacity for continuous renewal. This study agrees with Mintzberg (1994) that the organizational development and strategy making is a continuously adjusting process. Weick and Quinn (Weick & Quinn, 1999) also claim that changes in the business environment are an ongoing phenomenon. On the basis of this, we believe that approaching the organizational renewal process through the dynamic capability view (e.g. Teece et al. 1997; Zollo & Winter, 2002) and the knowledge-based view (e.g. Nonaka & Takeuchi, 1995) leads to continuous reconstruction in an organization. Due to the fact that capabilities are path-dependent and related tightly with present routines and practices, continuous learning and communication are essential for challenging individual and organizational mental models. According to several researchers and practitioners, knowledge creation and social communication include many barriers. In this study, the scenario process was applied to facilitate social communication and future-oriented knowledge creation in order to sustain the social interaction and future-oriented capability development. According to Schwartz (1996), the scenario process creates a strategic conversation and makes it possible to challenge present assumptions and mental models. Van der Heijden (2000) states that the scenario process allows to reflect different perceptions of the issue creating room for people to hear the arguments of others and engage in a comparison of different view points. To become justified and legitimized, new knowledge needs to be reviewed through some process (2001). Regardless of many advantages, the scenario approach has some disadvantages which we need to be aware of. According to Gode (2000) and

Van der Heijden (2000), the scenario approach is time consuming and the implementation requires always a strong support and participation from the organization's management. One risk is to have too much consensus or so called "group-think" which hinders the broadening of perspectives and decreases the differentiation of ideas. If participants are not familiar with the approach, the organizational hierarchical relationships might hinder the delicate conversation. The scenario process is always human driven and is exposed to biases.

## **9 Conclusion**

This study has suggested guidelines for organizational knowledge management and proactive capability development. The problem with knowledge management often lies in the fact that organizations and individuals do not understand the fundamentals of the knowledge creation process. They rush into information without a clear shared vision.

We noticed that if organizations become familiar with knowledge creation they can both develop appropriate knowledge and renew their capabilities, and utilise them further in the business objectives of the overall organization. Knowledge creation and sharing need appropriate methods and practices for the managing of tacit and explicit knowledge. The scenario process proved to be a capable management tool for knowledge creation and sharing. During the scenario process, the participants were also able to challenge their mental models and cross the existing individual and organizational boundaries. The scenario process also helps to overcome communication barriers.

It is also well-known that as innovation cycles are short and the technology is changing rapidly, organizations need to create flexibility, ability to learn from the market by recognizing customers' latent needs, and manage scarce capabilities. They need abilities to exploit their existing capabilities and knowledge base, but they also need dynamic capabilities which are employed when a company acquires knowledge and builds new capabilities for future needs. In a changing environment, the ability to sense and seize new opportunities (Teece, 2000) and to build and reconfigure knowledge-based assets is crucial to the long-term competitiveness of organizations.

In the development of new capabilities, companies and other organizations need tools and routines for systematic information processing and knowledge creation. During the

research project it became clear that the scenario approach is a successful tool enabling the proactive management of knowledge and fostering the communication of knowledge in large business networks. The scenario process made it possible to examine the company-specific capabilities and recognize environmental changes which was important for organizational renewal and the creation of appropriate capabilities in the participating companies.

The scenario approach has been traditionally used for anticipating the future development and drawing alternative descriptions of the future. This study demonstrates the usability of the scenario process as an effective method to establish a structured and managed process for social communication and to support the on-going knowledge creation.

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