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Framework, Methods and Tools for Acquiring and Sharing Strategic Knowledge of the Competitive Environment

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"When you go for the jump, you are all alone.
There, at the end of the jumping hill,
you must make your own decisions, all alone"

Matti Nykänen, ski jumper, World Champion

This work is dedicated to all the experts at the top of their career, sharing and utilizing their expertise and making critical decisions.

FOREWORD

Janne Ahonen, the winner of the World Championship in Ski Jumping in 2005, described his last jump in the contest by saying, that he jumped so long, because he knew it would be his last jump this year, and he wanted to enjoy it. The jump was the longest ever on that hill. Another legendary champion in Ski Jumping, Matti Nykänen, stated that he never wanted to become rich, he just enjoyed jumping. The Formula One driver, Kimi Räikkönen, commented his career as a F1 driver:

> "I am enjoying the battle for the Championships, which is one of the closest fights for many seasons. I have developed a lot, and I am looking forward to continuing this progress next year." (McLaren 2003).

Common to these champions, recognized experts in their own fields, seems to be:

- The joy of practicing their expertise and mastering their own field
- A lack of expression of emotions after receiving rewards (trophy, money, recognition)
- Difficulties in describing their feelings, performance and achievements.

Matti Nykänen has tried to express his skills and emotions, and he is well known for these statements.

> "When you go for the jump, you are all alone. There, at the end of the hill, you must make your own decisions all alone..."
>
> "Always when I jump, and I reach the end of the hill, I have this bon voyage feeling, a feeling that I have experienced this once before." (Nykänen 2005)

Besides the difficulties to express himself verbally, these statements demonstrate the difficulties of articulating the emotions, experiences and decision–making process of an expert. The experts typically respond to situations intuitively, by quickly recognizing the situation and evoking an appropriate answer.

Besides the statements demonstrating the topic of the dissertation, they also demonstrate the joy I had as the author writing this dissertation. Producing new ideas, innovating and articulating my thoughts has brought me a lot of fun, and smiles. As the writing process itself was very rewarding – sometimes completing the work and graduating did not seem to be so important.

The empirical research was done while working in Switzerland, at ABB Corporate Research. I want to express my gratitude to all the people participating in the Business Technology Portals Project, or helping in some other way. Special thanks I want to direct to PhD Esther Gelle, who was the Group Leader of the Information Management Systems, and an important participant in the project in her many roles. Her experience and advice have been important for the success of the project and for my dissertation. In addition, all the other team members contributed much in their own roles, e.g. Tea Lantto, Anu Saxholm, Julien Le, Michael Riffel, Victor Schepik, Hans–Werner Borchers, Vineet Ahuja, Johnny Vartiainen, Anne Tissen and Kirsi Hannonen. I had the pleasure of working with all of you, and I really appreciate your efforts and time. I also want to thank the whole Information Technologies Department and all the other friends in Switzerland – thank you for being friends, helping me to adjust to a new culture and enjoy life there.

Besides the project team, the ABB group technology management has contributed significantly in many ways, e.g. Klaus Ragaller, Jan Bugge and Even Bakke. Harsh Karandikar, the program manager, has contributed in so many ways – I owe deep gratitude to him for his guidance and support throughout the research. The work was funded by the research programs, mainly managed by Harsh Karandikar. This is also gratefully acknowledged.

The work was undertaken for Vaasa University, where Professor Josu Takala provided a supportive environment and guidance for my studies and for creating this dissertation. Tauno Kekäle, as my supervisor, has had significant role in encouraging me to believe in my own skills in scientific work and to continue in times when my own faith in completing the work was low. Thank you very much for your positive attitude, and for your valuable advice during the whole process.

The preliminary examiners Professor Tatjana Welzer and Professor Mika Hannula have invested time and effort to examine this thesis, providing valuable feedback and comments. The feedback, questions and comments from you and from Marja Naaranoja have enabled me to improve this dissertation. I would also like to thank

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In addition, I owe gratitude to my colleagues and friends in ABB Distribution Automation, and to my friends and colleague all around the world. I would also like to express my warmest thanks to my parents, who have supported and helped me throughout my life. In addition, I want to express my gratitude to Mika, who supported me, understood my need to work privately and stayed out of my way during all those weekends when I was writing the dissertation at home.

I have been very lucky to have had help and support from so many persons. Because of all this support, it is difficult to mention everybody in this section – therefore, I want to express my gratitude to all of you not mentioned here by name.

Mustasaari, 19.4.2005

Katja Rajaniemi

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[2] Karhu, K. (2002) Expertise cycle - an advanced method for sharing expertise. Journal of Intellectual Capital 3: 4.

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ABSTRACT

Rajaniemi, Katja (2005). Framework, methods and tools for acquiring and sharing knowledge of the competitive environment. *Acta Wasaensia* No. 138, 206 p.

When planning strategy, organizations often concentrate on developing a long–term action plan, and neglect scanning the competitive environment and adjusting to it. Due to increasing volatility, globalization and fast changing markets, the best organizations realize that success demands systematic and continuous scanning.

The objective of this dissertation is to develop a framework including appropriate methods and tools for acquiring and sharing strategic knowledge of the competitive environment, which will be used for strategic technology planning purposes.

Constructive research and qualitative research are the main features of the research strategy, aiming to create understanding of the phenomena and a construction that is suitable for the situation. Full objectivity or generalization is not in focus.

The Strategic Knowledge Cycle is used to acquire and share strategic knowledge of the competitive environment. Experts scan the environment systematically, using interviews and portals containing advanced tools. The tacit knowledge of the expert is transferred into explicit knowledge, analyzed, summarized and shared with managers. As use of the framework and the included methods and tools are described, implemented and tested using case studies, and their use extended, the construction is considered useful, appropriate and of real practical value in promoting effective scanning.

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Key words: tacit knowledge, expertise, acquiring and sharing knowledge, strategic knowledge.

1 INTRODUCTION

1.1 Strategic Planning

Strategy consists of various elements: analysis of the competitive environment, positioning of different organizations and directions for developing the business. (EIRMA 2001) Strategy links the activities and the competencies of the company to the competitive environment; the fit defines the success of a company. A strategic planning system is a process that organizes and coordinates the activities of the managers, who plan the strategy. (Lorange & Vancil 1976).

According to the EIRMA (2001), strategic planning contains the following phases:

- Scanning the competitive environment
- Defining competitive positioning
- Strategic choices
- Implementation.

This dissertation focuses on the first phase, which is scanning the competitive environment for strategic planning purposes, especially for strategic technology planning. Roussel, Saad and Erickson (1991) have discussed the role of scanning the competitive environment and linking the strategic activities and competencies to it, claiming that there are stable times in the competitive environment when the management should show results, and times when they need to initiate changes. The challenge of the management is to know when the time for change is right. Scanning the competitive environment is crucial for knowing when change is needed. Hammer (2001) addresses the importance of scanning the competitive environment by stating that managing change is the core of business management. However, it is quite common for organizations to concentrate on the other part of the strategic planning, which is developing an integrated, coordinated and consistent long–term plan of action, and neglect scanning the competitive environment before adjusting to it (Lorange et al. 1976; Montgomery & Porter 1991). This happens despite the fact that managers typically acknowledge the importance of scanning the environment.

1.2 Competitive Environment

According to Porter (1979), competitive environment consists of competitors, underlying economics and the classical competitive forces, which are the bargaining power of suppliers, customers, and the threat of new entrants or substitute products. As Porter is the most recognized expert in strategic planning, and as his practical definition describes the content of the competitive environment, it has been selected for this dissertation. In this dissertation, the focus in strategic planning is strategic technology planning, and therefore the concept competitive environment includes key and emerging technologies, in addition to the content defined by Porter. Key and emerging technologies have been added because of their significance in strategic technology planning, e.g. they create possibilities for substitute products or new entrants.

The importance of knowing the technology and its trends has been explained by Steele (1989), who states that every strategic plan contains an implicit technology forecast, e.g. assuming that existing technology provides an adequate base for success. One of the essential strategic decisions is directing research and development investments, because significant time and money commitments are made. However, this prospect is often a neglected issue in strategic planning and not considered as being at heart of the business (Wheelwright & Clark 1995).

As successful exploitation of technology is necessary for many businesses, technology strategy must be integrated with business strategy. Only when the strategies are well integrated and highly responsive to changes in the competitive environment, can organizations have all the necessary capabilities to succeed in the market. In R&D, the strategy is integrated with product development by managing project portfolios, whereby the R&D is managed to create products that reflect the needs in the competitive environment (Martinsuo, Aalto & Artto 2003).

Because the volatility of the competitive environment is constantly increasing, the accelerating changes in customer needs, fast development of technologies and time to the market are the main drivers for change in today's competitive environment (EIRMA 2001). In this dissertation, the competitive environment is seen as dynamic, having characteristics of the increasing volatility of the whole competitive

environment, accelerating changes in customers´ needs and fast development of different technologies.

Due to the increasing volatility, globalization and fast changing market, the best organizations have realized that success demands the best knowledge of the dynamic competitive environment, and the ability to react to it quickly, at any time. Therefore, strategy planning is a continuous process. Such a strategic planning approach lets the available information determine the feasible decisions that can be made – instead of deriving information requirements from the decisions that need to be made. To support a continuous strategic planning process, we need tools and methods that enable, complement and provide the means for it through scanning the competitive environment continuously.

1.3 Overview of Scanning the Competitive Environment

Continuous scanning of the dynamic competitive environment requires using the whole organization, at least a large number of its experts, to acquire and share their knowledge (Gendron 1998; Prewitt 1998). Implementation of the strategy reveals its success (Mintzberg 1994). The implementation is best encouraged through sharing the reasons for selecting certain strategic directions; this can be achieved by integrating a big part of the organization into scanning the environment (Gendron 1998). In addition, continuous scanning of the dynamic competitive environment and including a wide group of people for scanning is needed because of the amount of work required to scan the whole scope of the competitive environment. To enable efficient continuous scanning of the competitive environment, a framework containing tools and methods to continuously acquire and share knowledge is needed. Time and money savings can be searched for by utilizing information technology, which has been able to improve the efficiency of work in manufacturing and in other areas of white–collar work.

During recent years, customer focus has dominated the thinking in many organizations, whose scanning of the competitive environment has been driven by scanning customer needs. This emphasis on customer orientation has been suggested by different scholars and different fields of management literature, e.g. customer

orientation is one of the key values of TQM. Scanning of the competitive environment has been mostly done by sales and marketing people who are regularly in contact with the customers. The dominant customer focus in scanning the competitive environment can be verified by observing the work in organizations and by viewing articles on the topic. Most of the articles on scanning the competitive environment can be found in marketing oriented magazines. The dominant customer focus, and resulting lack of focus on other parts of the competitive environment has been noticed by surprisingly few researchers, even though such a lack probably causes non–optimal decisions, e.g. in strategic technology planning.

2 OBJECTIVES OF THE STUDY AND RESEARCH STRATEGY

The research approach, and the factors that have mostly affected the research approach and methods used for the study are presented in this chapter. In addition, research workflow and structure of the dissertation is explained.

2.1 Objective of the Study

Profound knowledge of the competitive environment, especially of customer needs, has been ranked as the most important reason for unsuccessful product development projects (Hanna, Ayers, Ridnour & Gordon 1995; Kärkkäinen 2002). The number of unsuccessful R&D projects indicates that organizations have difficulties in acquiring, sharing and utilizing the strategic knowledge of the competitive environment.

The objective of the dissertation is to develop a framework including appropriate methods and tools for acquiring and sharing strategic knowledge of the competitive environment, which will be used for strategic technology planning purposes. The developed construction should be unique and new in order to increase the cumulative knowledge of the theory.

In order to reach the objective of the study, several other targets are to be reached. These targets are:

- Challenges and generic development ideas in the field of acquiring and sharing strategic knowledge of the competitive environment for strategic technology planning should be understood and described.
- Currently used methods and tools are evaluated based on the available literature, in order to make conclusions on the best approach for the construction. Further on, methods and tools are evaluated to compare the proposed construction with methods currently used by organizations.
- The proposed framework, methods and tools are described, implemented and tested using case study methodology to describe and evaluate experience of their use.

- The framework for acquiring and sharing strategic knowledge, where the developed methods and tools are included as essential parts, is described.

A framework is a skeletal structure designed to support or to enclose something. A method is a procedure, technique or planned way of doing something. A tool is anything used as means of accomplishing a task or a purpose. (Webster's 1997) In addition, a tool is defined as an instrument for doing work (Wordsworth reference 1995). In this dissertation, the framework is the overall structure called the Strategic Knowledge Cycle. The Strategic Knowledge Cycle contains the specific methods and tools created for acquiring and sharing strategic knowledge of the competitive environment for strategic technology planning. The presented methods are more detailed procedures used for acquiring and sharing strategic knowledge of the competitive environment, e.g. for finding relevant information sources, assuring information quality, selecting knowledge stewards, utilizing internal networks and sharing expertise. The presented tools are instruments used to support and realize some of the methods utilized for sharing and acquiring strategic knowledge of the competitive environment, e.g. news storage, competitor search tool and patent search tool.

Even though the framework is developed for sharing and acquiring strategic knowledge of the competitive environment for strategic technology planning, the developed framework, and most of the methods and tools could also be applicable for other strategic planning purposes. In addition, it could probably be used to share other kinds of strategic knowledge. As the suitability for other areas of strategic planning has not been verified, it remains as a topic for future research.

2.2 Relevance of the Topic

The reason for selecting the developing of strategic planning is the recognition that the work of management has usually been the last to be developed. Another reason was the recognized challenges in current practices of strategic technology planning, which are described in the next chapters and in article 1. The knowledge management challenges related to acquiring and sharing competitive environment knowledge are recognized

based on the author's experience in this field, and based on literature. The existence of these challenges is an assumption for the study.

The expectation is that appropriate methods and tools for acquiring and sharing strategic knowledge of the competitive environment for strategic technology planning can be found. The theory of environmental scanning is used to establish an understanding of the current situation and its challenges.

Challenges in acquiring and sharing strategic knowledge of the competitive environment were recorded based on the literature. The challenges and where they are described in this dissertation are given in the Table 1. The literature and the experiences revealing these challenges are described in subsequent chapters and in the articles.

The aim is to enable the making of good strategic decisions. When profound knowledge of the competitive environment exists and organizations are able to utilize it efficiently, these prerequisites will facilitate successful strategic choices that can help the company be more successful in the market. The topic is interesting and relevant, because of the significant increase in access to information due to the Internet publishing phenomenon, and because most western companies are pushing aggressively into new Asian and Latin American markets that they do not know well.

Knowledge management is used to understand and to describe strategic knowledge of the competitive environment, and to find means of developing the acquiring and sharing of it. The combination of advanced knowledge management methods for enhancing the acquiring and sharing of strategic knowledge, and the latest full–text search technologies using the Internet as the source for scanning the competitive environment makes this research topic even more unique. Some articles that touched on the topic slightly were found. However, no literature with the same focus was available, therefore a clear research gap was found. This claim has been verified by the database search described in Chapter 3, where no good descriptions of the topic were found.

Table 1. Challenges in acquiring and sharing strategic knowledge of the competitive environment and where the challenges are described in this dissertation.

Challenge	Location
Some available discussions on sharing tacit knowledge exist; however, sharing expertise is a topic on which there is not much knowledge.	Article 2
Organizations often neglect continuous and systematic scanning of the competitive environment.	Articles 1 and 5
The use of full text search methodologies and Internet, as the source of competitive environment information is not a well–known topic.	Article 3
Scanning is performed only by few people, without adequate resources, and therefore the scope of the scanning has not been wide enough.	Article 3
Organizations neglect combining business and technology considerations when scanning the competitive environment.	Article 1
Instead of scanning the complete competitive environment, scanning has been focusing on customers, which has caused a lack of scanning other aspects of the competitive environment.	Chapter 1, Article 5
Managers suffer from info stress, receiving too much information.	Article 1
Information is transferred in pieces that are often incoherent and in conflict with some other pieces.	Article 1
New information from recent scanning is not integrated into existing information of the organization.	Sections 3.3.4 and 4.2.2
The strengths of computers and humans have not been utilized by integrating them successfully into the same systematic scanning process.	Article 5
Managers do not typically use various sources of information, e.g. online databases, but rather acquire knowledge through their informal networks.	Chapter 3

2.3 Research Strategy

The research approach has been to develop a construction, the use of which would eliminate or decrease the effects of the recognized challenges. If the construction is successful in eliminating or decreasing these effects, it is considered useful and applicable. The construction could be considered as new and unique, as other existing methods have not been able to eliminate or decrease these effects.

The theory–building approach has been selected for the dissertation, instead of the theory–testing approach that is more commonly used (Eisenhardt 1989). The selection includes the decision to use constructive research, which is still relatively little known and used in business and managerial studies, although it has continuously been gaining more popularity. The objective of the dissertation, to develop a framework including appropriate methods and tools for acquiring and sharing strategic knowledge of the competitive environment, encourages the forming of a construction, and testing the construction in practice using case studies. As constructive research combines empirical and normative features, it enables us to solve relevant problems of business management by creating innovative frameworks, methods and other constructions, and to test the functionality of the constructions during the research process (Olkkonen 1993). These features, and their match to the objective of the study, have been the essential factor in the decision to use the constructive research.

Several conceptual descriptions of scanning the competitive environment exist, forming the basis of the existing knowledge. However, not many constructions or case studies were found in the literature. As described by Eisenhardt (1989) in his maturity theory, when the field is difficult, conflicting or new, conceptual methods are popular. Later single and the multi–case studies are implemented to test the conceptual methods. In the next stage, surveys start to appear, and finally, when the theory base of subject area is established, mathematical models start to drive the research. According to this theory, constructions are useful especially when developing a theory. There is not enough knowledge of the research topic in the literature and not enough existing experiments that could have been reviewed, followed up or investigated through questionnaires. Therefore, constructing a framework including methods and tools, and testing it with case studies was considered the most suitable option to produce significant new knowledge.

In addition, the author had a good opportunity to create a construction and test it in several business units because of her position in the case company. Other factors that affected the choice of constructive research were that other researchers utilized and recommended the approach, and the author had knowledge related to constructive

research before starting the study. Therefore, the use of constructive research was a very natural selection for the dissertation.

In conclusion, the first feature of the research strategy is the choice of using constructive research. Qualitative research is the second feature, meaning that full objectivity or generalization is not in the focus of the dissertation. Rather, the aim is to create in–depth understanding of the phenomena and to develop a construction that is suitable for the situation. However, some quantitative views have been included, e.g. in article 5. The combination of creating a construction, using case studies to test the construction and utilizing qualitative research is typically applied in theory building in similar situations. The combination is appropriate for creating proper understanding of the phenomena, especially when not enough studies exist in the literature.

Besides the empirical data, continuous interaction with the theoretical framework and existing publications has been in constant focus. As the author's position gave her the opportunity for empirical research, the main data sources in all but one article are empirical data sources, e.g. experiments, discussions and different case studies.

2.4 Research Work and Workflow

The author has been full–time project manager of a project team developing and deploying the described framework, methods and tools in different business units of the case company. Therefore, the contribution of the author is an essential part of the study, especially directing the constructive work, linking it to the knowledge management and environmental scanning literature, deploying the methods and tools in several business units, and specifying the needed functionality of the advanced computer based system and tools. However, the author has not contributed to designing and implementing the advanced information technology based tools, which was the focus of the other researchers involved in the project.

The research started with a request from the technology management of the case company, who described the challenges in acquiring and sharing strategic knowledge for strategic technology planning. They asked for help in improving the practices. After

recognizing challenges in strategic technology planning, (see article 1), providing good quality information was selected as the target. To improve the quality of the information, the features of good quality information were defined based on user opinions, according to the TQM principles "fitness for use". The defined features were to have less information but the provided information should be recent, relevant and reliable.

The study started with empirical observations and a collection of information from the literature, after which insight emerged. One of the first decisions was to improve practices by developing portals for sharing information in distributed organization, and to include tools for helping people to search for information, containing as many automatic features as possible. Distributed organization is an organization that consists of people distributed to several locations. Therefore, different technical solutions for the portal platform and for the advanced tools were evaluated.

The interaction of the research process and earlier literature was continuous during the whole research, making the process iterative. The construction was linked to knowledge management and to the environmental scanning literature continuously while seeking good ideas and best practices from them. The objective of the dissertation was ready and decided before the articles were written; however, during writing article 1, the situation became clearer. Since the other targets were formulated while creating the construction, the chosen research strategy, and the possibilities and the limitations related to it, shaped and formulated the other targets of the study. Hence, the relationship between the objective, other targets, and the research strategy has been interactive and bi–directional.

In the next phase of the study, literature was studied to construct a framework, and to formulate methods and tools that are used to improve the quality through process development and information technology solutions. The reviewed literature included books and other publications on knowledge management, environmental scanning, strategic planning and competitive intelligence. Based on the described ideas, discussions and some experiments, the methods and tools to improve knowledge acquiring and sharing were selected. In addition, their use was combined into a framework

describing the whole process utilizing the developed methods and tools, which was later named the Strategic Knowledge Cycle.

The framework, methods and the tools were implemented and tested in 10 different business units of the case company. Generalization possibilities were considered based on the deployments, and the findings were reported. The study was continued with an extensive literature review forming a thorough knowledge of the existing methods used for acquiring and sharing strategic information of the competitive environment.

The study has been mostly described in articles that are presented in the second part of this dissertation. The selected research approach and methods, as well as data sources for each of the articles, are described at the beginning of each article. The type of dissertation consisting of separate articles has enabled the combining of different types of approaches and methods, allowing the creation of a rather diversified picture and understanding for both academic and practice–oriented use.

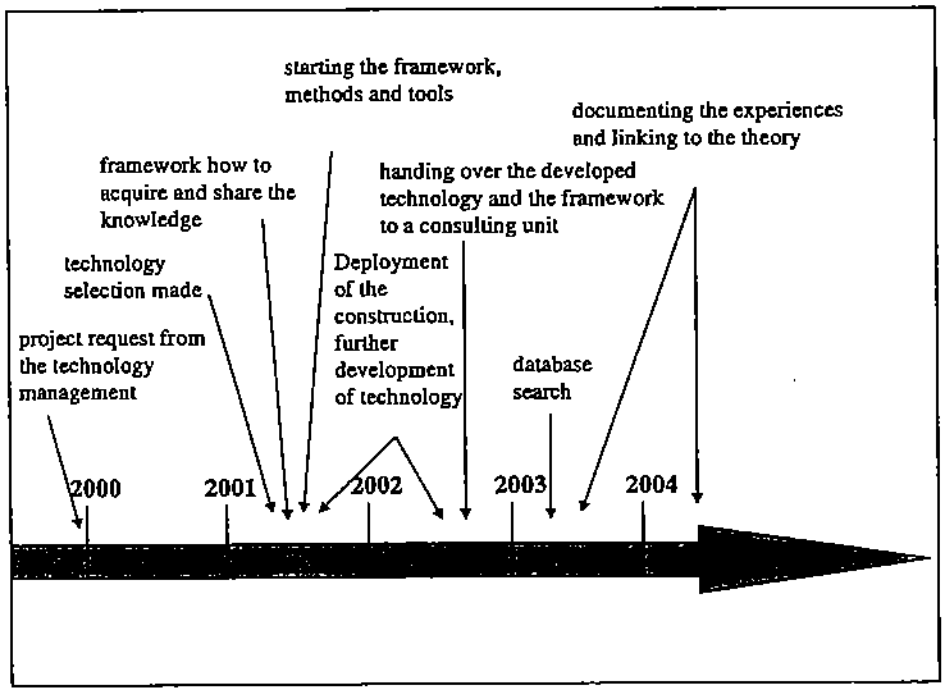

Figure 1. Research workflow in a time line.

2.5 Structure of the Dissertation

The dissertation comprises two parts: the introductory report and the enclosed articles. The introductory report first introduces the research topic, the objectives of the study and the research strategy. Chapter 3 explains the theory of environmental scanning and knowledge management with the research focus in mind. Next, the current methods that are used and proposed for scanning the competitive environment are presented based on existing literature. The rest of the introductory report concentrates on explaining the developed construction, explaining the empirical research, summarizing the articles and evaluating the construction and the whole dissertation.

2.5.1 Articles

Table 2. Articles and publication information.

Authors and Name of the Article	Information on Article
1. Karhu, K. (2001). Knowledge Management Challenges: Information Management for Technology Strategy Planning	*Proceedings from Ismick 01 Eight International Symposium on the Management of Industrial and Corporate Knowledge.* 22–24 October 2001. Université de Technologie de Compiègne, France
2. Karhu, K. (2002) Expertise cycle - an advanced method for sharing expertise	*Journal of Intellectual Capital* 3: 4
3. Rajaniemi, K. Internet based scanning of the competitive environment	*Benchmarking: An International Journal.* Tentatively scheduled for Issue No. 6, Vol. 13 2006.
4. Gelle, E. & K. Karhu (2003). Information quality for strategic technology planning.	*Industrial Management & Data Systems* 103: 8.
5. Rajaniemi K. (2005). Literature research approach on research topic: scanning competitive environment	*FeBR 2004 Frontiers of e-Business Research 2004* Volume 2.

The study has been mainly described in articles that are presented in the second part of this dissertation. Articles 1–4 have been through a peer review for the whole content, and Article 5 has been through a peer review for the abstract. The articles have been

published in international journals or conferences. The articles with their publication information are listed in Table 2. The author of this dissertation is the author of the articles. However, the last name of the author was Karhu until the summer 2004.

The enclosed articles explain the construction from different approaches. The background information is given in the first article, which presents the knowledge management challenges in acquiring and sharing strategic knowledge of the competitive environment for strategic technology planning. In addition, it drafts the development ideas.

The next three articles present different views on how to develop the acquiring and sharing strategic knowledge, each article from its own specific approach. Article two concentrates on the process of sharing tacit knowledge, and proposes a framework called the Expertise Cycle. Article three discusses different information sources that can be used for scanning and proposes methodologies on how to acquire information from different source types in the Internet. Article four presents the information quality view and how the information quality can be enhanced with modern full–text search technologies. Article five describes the literature on scanning the competitive environment, and summarizes the methods and tools that are used for acquiring this knowledge. The articles and their content are described in more detail in Chapter 6.

The articles can be regarded as separate, individually reported studies, linked together with the objective and the targets of this study, thus forming a logical entity. The source within dissertation describing each challenge is presented in Table 3. However, it must be noted that only the main sources within the dissertation are mentioned.

Table 3. The relationship between the research targets and the articles.

Research Target	Source within Dissertation
Challenges and generic development ideas	– Article 1 "Knowledge Management Challenges: Information Management for Technology Strategy Planning"
Practices and methods used	– Article 5 "Literature research approach on research topic: scanning competitive environment" – Section 3.4 of the Introductory report
Framework for acquiring and sharing expertise	– Section 4.4 of the Introductory report
Proposed methods and tools	– Article 2 "Expertise Cycle – An Advanced Method for Sharing Expertise" – Article 4 "Information Quality for Strategic Technology Planning" – Article 3 "Internet Based Monitoring of the Competitive Environment"

The constructive approach, which is the selected research approach of this dissertation, has the following stages:

1. Finding a relevant problem with research potential
2. Acquiring generic knowledge of the topic
3. Constructing the solution
4. Showing the theoretical connections and the research contribution of the solution
5. Examining the scope of applicability (Kasanen, Lukka & Siitonen 1991).

These stages of the study are described in this dissertation, Table 4 presents the location of the description of each stage.

Table 4. Location of description for constructive approach stages within the dissertation.

Stages of the constructive approach	Part of the dissertation where the stage is discussed
Finding a relevant problem with research potential	Article 1; Chapter 1
Acquiring generic knowledge of the topic	Chapters 3 and 4; Articles 2, 3, 4 and 5
Constructing the solution	Articles 2, 3 and 4; Chapters 4, 5 and 6
Showing the theoretical connections and the research contribution of the solution	Articles 2, 3, 4 and 5; Chapters 5 and 7
Examining the scope of applicability	Chapter 7

2.5.2 Invention Disclosures

In addition to the articles, several invention disclosures related to the technical implementation of the tools and the methods developed for the construction have been

Table 5. Invention disclosures related to the technical implementation of the tools and methods of the construction.

Identification	Title
EP1363203	System and method for searching information automatically according to analyzed results
EP1343077	Process and system for presenting help information in a data processing system
WO03054727	Catergorizing system for data objects and method for verifying the consistency of assignments of data objects to categories.
EP1324220	Process and system for generating and improving a collection of information objects
EP1324219	Method of searching based on categories for information objects in information pools and system to find such information objects
EP1324218	System for categorizing data objects and method of checking the consistency of the designation of categories to the data objects
WO03048930	Process and system for presenting help information in a data processing system.

created by the Business Technology Portals project team. Those invention disclosures are listed in Table 5. The amount of work and innovation of the invention disclosures has been almost equally split between the team members mentioned as the authors, therefore the contribution by the author of this dissertation has been approximately 20 percent per each of the invention disclosure. Summaries of the invention disclosures are presented in Appendix 1.

3 ACQUIRING AND SHARING STRATEGIC KNOWLEDGE

This chapter describes the theoretical framework used in the dissertation, the theory of knowledge management and environmental scanning. Knowledge management theory is utilized to understand and describe strategic knowledge of the competitive environment, and to find means of developing acquiring and sharing strategic knowledge. The theory of environmental scanning is utilized to build the knowledge of scanning the competitive environment, in existing and proposed scanning practices, and to understand the challenges in existing practices.

3.1 Knowledge

3.1.1 Definition of Knowledge

No consensus exists in the literature as to how knowledge should be defined. This is a challenge, however it is not surprising that such basic definitions have not been agreed, when considering the speed at which knowledge management thinking pervaded the management literature. Some authors have even suggested that it is of little use or not productive for practitioners to define knowledge (Davenport 1998; Snowden 1997).

Common part to different definitions of knowledge is the approach of defining knowledge by comparing it to information. For example, knowledge has been defined as a meaningful set of information, which is combined with experience, context, interpretation and reflection or embodied with technical skills (Davenport 1998; Nonaka & Takeuchi 1995). Compared to information, knowledge is a concept that is more dynamic and closer to action (Davenport 2000; Nonaka & Takeuchi 1995).

Knowledge can be used to create more knowledge. Walsh and Ungson (1991) have earlier defined knowledge as the immeasurable resource that is embedded in documents, repositories, routines, structures, practices, norms and culture. Gourlay (2001) describes that activity triggers parts of tacit knowledge storage and activates it, and he adds that knowledge representations have often been called knowledge: acquisition, storage and accessing are actually targeted to knowledge representations. Tuomi

(1999) has defined knowledge from three perspectives a) knowledge as an accumulated resource that underlies capabilities and enables performance b) knowledge as a structure that constrains activity and makes actions effective c) knowledge as a product that enables the changing of existing constraints for action and leads to development.

This dissertation uses the definition of knowledge as meaningful set of information, which is combined with experience, context, interpretation and reflection or embodied with technical skills. The authors Davenport, Nonaka and Takeuchi are well recognized as experts in knowledge management. Because of their expertise and because of the suitability of their definitions with the author's ideas of acquiring and sharing knowledge, these definitions of knowledge have been selected for this dissertation.

3.1.2 Strategic Knowledge and Information

The adjective strategic means important in or essential to strategy. (Webster's 1997) Choo (1997) states that to become strategic, information must be galvanized into understanding and knowledge to guide action. Aquilar (1967) states that no type of information is originally strategic, it only becomes strategic if it relates to a strategic opportunity or problem. Strategic data is data, which will help to identify and understand strategic threats and opportunities. In this dissertation strategic information is defined as information that is used for strategic purposes, i.e. information that is important in creating strategy. By this definition, fitness for use is a mandatory feature of strategic information. Consequently, strategic knowledge of the competitive environment is knowledge of competitors, suppliers, customers, new entrants, substitute products or key and emerging technologies, which is used for strategic purposes.

In addition to the fact that Choo is a recognized expert in this field and uses this definition, the definition has also been selected as it fits well

- with the process view of environmental scanning containing the step of information use

- with the feature of information quality being fitness for use
- with ideas of avoiding information waste and info stress.

3.1.3 Knowledge Categorizations

Knowledge can be categorized in several ways, e.g. into explicit and tacit knowledge, private and public knowledge, and organizational and individual knowledge. This dissertation contains all these perspectives. However, it focuses on the aspects of managing tacit knowledge and its special category expertise. The reason is that extensive, unique tacit knowledge, expertise, is needed to form an overview of the competitive environment, and to further provide summaries and analyze of it. In addition, expertise is needed when scanning the environment to recognize which change is significant. The tacit knowledge of a person needs to be transferred to organizational knowledge, and to the tacit knowledge of another person, so that decision makers and other interest parties are able to utilize it for strategic decision making.

3.1.4 Expertise and Tacit Knowledge

Polanyi (1966) explains tacit knowledge by expressing that people know more than they can tell, and this part of their knowledge is called tacit knowledge. Earlier tacit knowledge was called by different names, e.g. practices and cognitive skills (Turner 1994; Anderson 1980). Tacit knowledge is knowledge of practices that people have learned to do, but which they cannot explicitly describe. For example, riding a bike or driving a car is based on tacit knowledge. Describing tacit knowledge is difficult when using words, because an "auto pilot" guides the actions (Sveiby 2001; Nonaka 1991). Expertise is a category of tacit knowledge, emphasizing the uniqueness of a person's knowledge (Von Krogh, Ichijo & Nonaka 2000). For example, riding a bike is categorized as tacit knowledge; however it is not expertise, since it is a common skill.

Expertise is based on extensive unique knowledge. Armed with this knowledge, an expert is prepared to respond to many situations intuitively, by recognizing the situation and evoking an appropriate answer, and by using his experience for analyzing new, difficult problems. In the daily work of the expert, preserving, applying and

creating knowledge are interdependent, even though the theory tends to separate the phases. (Simon 1996; Starbuck 1992).

Managing tacit knowledge is really the part of knowledge management that is new to theory. Managing explicit knowledge has been discussed and experimented with for years within the field of information management (Snyman 2001). Consequently, fresh ideas on how to develop the acquiring and sharing strategic knowledge of the competitive environment are searched for from the point of view of managing tacit knowledge. Smoliar (2003) has reminded us that knowledge management should not be about managing knowledge, as the knowledge management literature often faultily assumes – but managing people whose work depends critically on what they know. These modern views are taking over the first phase of knowledge management thinking, which concentrated on managing explicit knowledge.

3.2 Acquiring and Sharing Strategic Knowledge

As managers do not have the time to scan the competitive environment properly, other people, experts, are used for the purpose. Consequently, both acquiring and sharing knowledge are important for this dissertation. These different aspects of knowledge management are discussed here.

3.2.1 Definition of Sharing Knowledge

Besides lacking consensus on a definition of knowledge, there are even fewer attempts to define the concepts of knowledge transfer and knowledge sharing, and therefore no consensus exists on what is the actual difference between these two concepts. Neither have the concepts been systematically used in the literature. The following examples demonstrate different ways to use and combine the concepts of knowledge, information, sharing and transfer that exist in the literature. Garvin (1993) claims that reports and tours are the most popular media for knowledge transfer, however transferring people from one organization to another or establishing new standards, policies and training programs are other good methods to transfer knowledge. Quinn, Anderson and Finkelstein (1996) discuss information sharing and its criticality because intellectual

assets increase in value with use, but recognize that overcoming professionals´ reluctance to share knowledge is a challenge. Stories and learning histories have been proven to be successful at transferring knowledge (Kleiner & Roth 1997; Snowden 1999). Dixon (2000) explains that the organizations are now addressing knowledge sharing because of growing awareness of the importance of the knowledge, and technology that has made the sharing knowledge more feasible. She claims that exchange of knowledge happens only in a non-competitive and a non-collaborative culture, and adds that transfer of knowledge across time and space is needed for organizations to reinvent and update their common knowledge.

According to Webster's dictionary, sharing is defined as "to divide and distribute in shares" "to have a share or part, take part" or "to receive equally" and transferring as "to convey or to remove from one place to another" "to cause to pass from one person to another" (Webster´s 1997). These explanations do not either clarify the difference between the concepts when used in the context of knowledge.

As there is no consensus of the definitions of the phrases, this dissertation chooses to use the phrase knowledge sharing. The reason for selecting the use of the phrase knowledge sharing is that the sharing concept highlights the importance of a person actively contributing effort and time to enable successful sharing, compared to the mechanical moving of a piece from one location to another. A similar use of the concept knowledge sharing has been made by Barner-Rasmussen (2003) to highlight the fact that knowledge is social and contextual, and that differing mental models and physical contexts make knowledge sharing impossible.

3.2.2 Knowledge Spiral and SECI

Nonaka (1991) has introduced the Knowledge Spiral by explaining that new knowledge always begins with the individual, and afterwards it should be transferred into organizational knowledge. In a knowledge creating company, the four basic patterns of creating knowledge exist in dynamic interaction, a kind of spiral of knowledge. The phases are: from Tacit to Tacit, from Explicit to Explicit, from Tacit to

Explicit and from Explicit to Tacit. Articulation and internalization are the critical steps in this spiral of knowledge.

Later, Nonaka and Takeuchi (1995) have described the model in a book, naming it the SECI model according to the phases called socialization, externalization, combination and internalization. Socialization is converting the tacit knowledge of one person to the tacit knowledge of another person by discussions or sharing experiences. Externalization is knowledge conversion from tacit knowledge to explicit knowledge, which is done by articulating tacit knowledge using metaphors, analogies and models. Construction is combining, editing and processing explicit knowledge into a more complex and systematic set of explicit knowledge. Internalization is a process of embodying explicit knowledge into tacit knowledge, when people broaden, extend and reframe their existing knowledge. The internalization resembles the concept learning.

3.2.3 Sharing Expertise Using Artifacts

Due to the nature of expertise as form of tacit knowledge, describing and sharing it is difficult (Turner 1994; Nonaka 1994). Despite their existing knowledge and education, experts often resist sharing their knowledge because of their self–interest and narrow perspectives, creating additional challenges for knowledge sharing (Starbuck 1992). On the other hand, people are often willing to help others by sharing their knowledge, when there is a personal benefit to them, e.g. a smile from a person they like.

The most common proposal is to share tacit knowledge using artifacts, in documented form, as explicit knowledge. Of course, sharing tacit knowledge using artifacts demands that tacit knowledge is first converted to explicit knowledge. Sharing knowledge using artifacts fits well to global organizations, where time and location separates experts and knowledge seekers. However, experts often lack the writing skills, time and motivation to share their knowledge by writing. Even though sharing tacit knowledge using artifacts is often challenging because of the nature of expertise and experts, it should be nevertheless utilized for sharing explicit knowledge.

3.2.4 Sharing Expertise Using Knowledge Stewards

Using other people to document tacit knowledge is proposed by many authors, e.g. Sheehan (2001), Dixon (2000) and Leistner (2001), who emphasize that sharing tacit knowledge should be someone's job, otherwise it will not be written down. However, it is still not a common to employ people to document the knowledge of other people. Most organizations today claim that they cannot afford such a role.

External people, who write down experiences and the knowledge of others, are called knowledge stewards in recent literature. Knowledge stewards are people who are dedicated to acquiring information and knowledge from an organization, further analyzing and formulating it into a form that is useful for knowledge seekers. The role is mentioned in some knowledge management books and articles, e.g. Sasson and Sharon (2000) and Leistner (2001) explain that knowledge stewards interview and observe people in their work environment to capture what they know, to further document what they have learned, making the knowledge available for the entire organization. Knowledge stewards convert individual knowledge into organizational knowledge.

It is recommended to use and invest in knowledge stewards when:

- Documenting the knowledge is especially challenging – e.g. documenting tacit knowledge
- Knowledge is distributed.
- Knowledge is of great importance to an organization, so that the information available outweighs the additional cost. (Dixon 2000; Sasson & Sharon 2001).

Several authors have suggested that people typically rely on their informal networks when acquiring knowledge, and settle for information that is good enough, rather than seeking the perfect information. Within their informal networks people ask who knows what. Consequently, who a person knows defines what he is likely to know or learn (Sassoon & Cross 2001).

It has been widely agreed that relationships are critical for knowledge creation and sharing, e.g. Von Krogh, Ishijo and Nonaka (2000). However, it is unclear what kind of relationship is most effective, e.g. frequent interaction or trusting relationships

(Abrams, Cross, Lesser & Levin 2002). The relational dimensions, including culture of respect, friendship and bonding among organization members, are more important than the structural and cognitive dimensions (Chua 2002). Abrams et al. (2002) have concluded in their studies that the interpersonal trust that enables effective communication can be based on competence or the belief that a knowledge source knows what the knowledge seeker is talking about. In addition, interpersonal trust can be benevolence–based, which is the trust allowing knowledge seekers to ask questions without fear of damage to their reputation. Especially important knowledge based trust is when the knowledge to be transferred is tacit, complex or ambitious. (Abrams et al. 2002).

The other dimension of the importance of trust in knowledge sharing is organizational. Knowledge is often viewed as power, and those who share their knowledge can become unnecessary, especially when organizations rationalize and downsize their organizations. (Johnson 2002; Von Krogh, Ishijo & Nonaka 2000) This paradox has to be solved with a trusting organization before effective knowledge sharing is possible.

Besides trust, as the explaining feature of relationship, Cross, Baker and Parker (2002) have presented another interesting aspect, energy, claiming that people are much more likely to turn to and learn from energizers than de–energizers. An energizer is a person who typically is a positive person who encourages and motivates others and a deenergiser is a person who typically is negative towards most of the topics, presenting criticism and causing other people to feel unhappy. The assumption is that the role of relationships in strategic planning has not been acknowledged until now because of the limited role of emotion in organizational studies. Especially important are the informal networks and social contacts to managers, who, due to lack of time, delegate their information acquisition to their networks (Pirttilä 2000). Consequently, the idea of using knowledge stewards for acquiring and sharing strategic knowledge is well in line with how managers acquire knowledge in practice.

According to Wickramasinghe (2003), knowledge management systems are typically organizational memory systems, at best managing explicit knowledge, but forgetting to focus on tacit knowledge. He proposes building real knowledge management systems by building organizational expert networks, enabling discourse and sense making. This

statement is well in line with the approach of managing tacit knowledge being the new content of knowledge management theory.

3.3 Acquiring and Sharing Strategic Knowledge of the Competitive Environment

3.3.1 Environmental Scanning

3.3.1.1 Definition of Environmental Scanning

Environmental scanning is defined as acquisition and use of knowledge about events, trends and relationships in the environment of a company, knowledge that assists management in planning the organization's future course of action (Aquilar 1967; Choo & Auster 1993). Most of the other definitions of environmental scanning do not include the use of knowledge. Including the use of knowledge into the definition fits well to the definition of strategic knowledge as knowledge used for strategic purposes, therefore this definition has been selected for this dissertation. In this dissertation, use is considered in the context that the results will be used later for strategic decision making. Consequently, the acquisition, sharing and use cannot be totally separated and they cannot be viewed as independent activities. Scanning the competitive environment can be either done by the person making the decisions, or the scanning can be delegated, e.g. to a competitive intelligence department.

A feedback loop provides understanding about what kind of knowledge is needed and useful, which is especially important for continuous, systematic scanning. In the next round of scanning acquiring and sharing strategic knowledge can be improved based on the received feedback. For each organization, the fit for use has to be defined separately, by discussing with the users, the managers. Even though the importance of such discussions has been pointed out by many authors, Herring (2001) mentions that the absence of such activities is often the reason for unsuccessful experiences.

The process view of environmental scanning is essential for the proper understanding and facilitation of a series of activities, and for the effective development of complete

organizational operation and behavior. Van Vuuren (2001) has defined environmental scanning as a process in which an organization learns about events and trends in the external environment, establishing relationships between them and considering the main implications for problem identification and decision–making. The process–oriented definition of environmental scanning is typical for the later articles and is used in this dissertation. It matches well with the definition of knowledge as information combined with experience, context, interpretation, reflection and technical skills, i.e. the result of a series of activities that are carried by incremental steps. In environmental scanning, the information received from various sources is interpreted and used to acquire more knowledge of the competitive environment, which in turn can be used for strategic technology planning or further acquisition of knowledge. In this dissertation environmental scanning includes the use of knowledge only for further analyzing, for sharing the knowledge, and for receiving feedback on the usefulness of the shared knowledge, but the phases of making and implementing strategies are clearly excluded.

According to the definition by Porter (1980), environmental scanning covers competitors, suppliers and customers, but in addition it includes technology and economic conditions, political and economic environment, and social and demographic trends. The objective of competitor intelligence is to develop a profile of the competitors, and business intelligence concentrates on, in addition to current competitors, potential acquisition and mergers; consequently environmental scanning is a similar activity to competitor and business intelligence, with a wider focus.

As the environmental scanning includes competitors, suppliers and customers, technology and economic conditions, the political and economic environment, and social and demographic trends, the concept has a very similar focus to the topic of this dissertation, which was scanning the whole scope of the competitive environment, and this is no surprise as both of the definitions are created by Porter (1980).

3.3.1.2 Different Forms of Environmental Scanning

Environmental scanning uses public information as the source, that is all information that can be legally and ethically identified and accessed. Environmental scanning can be continuous, periodic or irregular (Choo 2001). Continuous scanning is focused on

opportunity finding and contributing proactively to the organization. Periodic scanning is more sophisticated, but still focused on problem solving and forecasting with limited scope and methodologies. Irregular scanning is reactive scanning; it contains general exposure to information with no specific purpose in mind. (Van Vuuren 2001). Pirttilä (2000) has divided competitive environment scanning into two parts:

- Informal scanning, mainly based on "mouth to mouth" information and informal networks
- Systematic scanning, based on public information available in the competitive environment.

Scanning contains several modes. The oldest and most commonly mentioned categorization is created by Aquilar (1967) and has been further used by many researchers e.g. Choo (2002): undirected viewing, conditioned viewing, informal search and formal search. In undirected viewing information needs are ill–defined and fuzzy. Conditioned viewing is focused on a small number of relatively well–defined issues, the viewing is, though, limited to routine documents, reports, articles and information systems that have developed through the years. Formal search is characterized by information needs that are based on well–defined, broad, detailed and open–ended search goals and informal search utilizes quantitative data, and develops explicit knowledge, e.g. search criteria to be used in formal search.

Despite the existing process descriptions, most organizations do not have a defined scanning process at all. This can be claimed based on the observations in many articles, e.g. Van Vuuren (2001).

3.3.2 Information Sources

For improving knowledge acquisition, both organizational and individual behaviors should be considered (Correia & Wilson 2002). This view is typical in environmental scanning literature, which considers how people and organizations acquire information. For improving the scanning of the competitive environment for strategic purposes, it is important to consider how managers, experts and organizations acquire

knowledge. However, focusing on how managers acquire knowledge is not often addressed in the literature.

Some research suggests that top management perceive internal, personal sources to be of high quality, and frequently use them in scanning (Choo 1994; de Alwis & Higgings 2002; Liu 1998). In addition, Correia and Wilson (2002). point out that top management use oral communication more than functional managers. Lozada and Calantone (1996) add that when the situation is considered uncertain, it is likely that managers utilize both written and oral sources, to assure the reliability of the information. This claim is confirmed by the statement that managers receive and use information from multiple, complementary sources (Auster & Choo 1994).

On–line information is considered a better source than most hard copy articles (Lackman, Saban & Lanasa 2000). Since on–line resources, especially the Internet, have not been widely used for very long and the tools that support and facilitate their use can be enhanced, it is forecasted that Internet–based information acquisition will grow dramatically during the next years. This trend has been verified by some recent studies, e.g. the investigation made by Kumar and Palvia (2001), who state that online information, suppliers/customers/trade associations are the most interesting external information sources. In addition, the trend in Executive Information Systems (EIS) is to transfer into Internet based solutions. (Basu, Poindexter, Drosen & Addo 2000). Already now, the Internet is one of the most significant information sources for competitor analysis, which has changed the nature of competitive intelligence due to the amount of available information (Hussey & Jenster 2000). However, since public information is available to everybody, the competitive advantage has to come from obtaining, analyzing and exploiting it before and better than the competition (Kahaner 1997). Despite the availability of various sources, e.g. company libraries and online information, managers do not exploit them often, mainly due to lack of awareness of their availability and usefulness, lack of use skills and lack of awareness of their own information needs. (De Alwis, Higgings 2002; Choo 1994).

3.3.3 Information Management Challenges

Info stress has been bothering managers lately; especially high overload is established in strategic and qualitative matters (e.g. marketing segmentation, competitive environment analysis and competitor analysis). Information overload is based on the amount and type of stimuli perceived by the observer. Besides quantitative overload, the overload phenomenon can be brought about by fuzzy, contradictory or incomprehensible supply, and information quality problems. Information surplus, unused information, is called information waste (Meyer 1998).

The articles describe that the goal of scanning activity is to enable action, e.g. formulating a new strategic plan and acting accordingly; therefore scanning provides significant value to the organization only if the results can be used well. Research shows that only 7 percent of the information collected and generated in corporations is further analyzed (Hu, Huan, Kuse, Geng–Wen & Wang 1998). Therefore, 93 % of the information within organizations could be called information waste.

Since the main purpose of managing information is to inform people, information acquisition has to be balanced by two opposing views, the organizations' wide–ranging information needs concerning changes and events in the external environment, and on the other hand, the limited capability of human attention – so that minimal amount of information waste is produced.

3.3.4 Acquiring Good Quality Strategic Information

In the previous pages, environmental scanning was seen as the acquiring and sharing strategic knowledge on the competitive environment, and associated methods and information sources were discussed. This section discusses acquiring information that is of good quality and consequently is more likely to be used for strategic purposes. First, the characteristics of good quality of information are described, followed by the problems the managers making strategic decisions have. The quality of the information is important, as it will be used for forming knowledge, (to internalize and create understanding of the situation), and later on to strategic decision making.

Fitness for use of a piece of information is measured by user perception, containing the following elements: accuracy, timeliness, accessibility, application and validity, error–free transfer, completeness of coverage, trust in its consistent quality, and inclusion of signals about the soundness of the data (Choo 1997). In addition, the information should be easy to use and without noise, e.g. right in focus, orientation and format. The presented characteristics describe generic information quality. However, quality of information is very context dependent, and therefore other characteristics have to be defined for each occasion separately, with targeted users. Information quality is explained in more details in Article 4.

3.4 Theoretical Background

3.4.1 Selected Theoretical Approach

The dissertation focuses on acquiring and sharing strategic knowledge of the competitive environment. The literature describing this field has been reviewed in order to form a deep knowledge of existing practices. The major challenges have been identified and listed in order to establish a construction that can provide improvements for those challenges in environmental scanning. The focus has been to describe existing or proposed methods, and to critically evaluate those methods, e.g. with respect to solving the recognized challenges.

For developing appropriate methods, an innovative theoretical background and approach was needed. As the objective is to improve the acquiring and sharing strategic knowledge, knowledge management theory was reviewed to establish understanding of its suitability for providing ideas on how to improve traditional environmental scanning methods. After scanning through the literature, managing tacit knowledge and its specific category expertise was found. It was recognized that the characteristics of expertise match very well with the knowledge and competence needed for acquiring strategic knowledge of the competitive environment.

As the resulting knowledge of the competitive environment is to be used for strategic decision making, and due to the time pressure of management making such decisions,

sharing knowledge between the person acquiring the knowledge and the person using this knowledge for strategic purposes is needed. After recognizing this, selecting knowledge management theory as the background theory for the presented construction, was confirmed to be appropriate, as knowledge sharing is described by knowledge management theory. Besides managing tacit knowledge, knowledge management literature typically describes managing explicit knowledge and storing such information in databases or in different kinds of information management systems. This approach is also needed in the construction, even though that is not the most innovative and new part of the built construction.

3.4.2 Alternative Theoretical Approaches

Other alternatives for theoretical background, besides environmental scanning and knowledge management theory, were considered. The most obvious alternative is competitive intelligence theory. Competitive intelligence is closely linked to the topic. Competitive intelligence discusses information about the competitive environment, though it focuses on competitors. The approach concentrates on utilizing advanced information technology for monitoring different kinds of databases, and providing intelligent and advanced techniques for managing such knowledge. As the main focus of competitive intelligence is information on competitors, those methods have been used for approximately the same purpose of scanning the competitive environment many times before, and therefore competitive intelligence probably would not provide a new and innovative approaches to strategic planning.

The last alternative to be considered was future studies. Future studies focus on developing practices to forecast possible futures, and it utilizes a set of tools for the purpose, e.g. SWOT, future tables, scenario building. Future studies concentrate on a systematic exploration of the future, and consider constructing alternative images of the future, grounding them in logic and in facts, and specifying the different courses of action that may lead to them (Bell 1997). A good overview of the tools and methods discussed in future studies is presented by May (1996).

In future studies methods are categorized into prediction, extrapolation, analytical forecasting, speculation, judgmental forecasting, management, policymaking, imaging and innovation. Especially scenario building is discussed in detail in many articles, e.g. in May (1996). Also in the future studies the Internet has been recognized as one of the most powerful agents in the world, affecting sciences, religion politics and culture (Glenn & Gordon 1997). Literature on future studies was scanned and studied, but not selected as the theoretical approach. The main reason was that the practices and methods discussed in future studies did not approach the recorded challenges, the elimination of which was set as the target for the development.

Consequently, it was decided that the potential for using knowledge management theory for providing improvements in existing practices was much higher than the potential of other alternatives, and therefore this approach was selected.

3.4.3 Key Literature

Classical descriptions of scanning have been written by Aquilar. Later, Choo has provided a lot of innovative and theory building studies and descriptions of scanning,

Table 6. The key literature used in the dissertation.

Knowledge Management	Scanning the Competitive Environment
Nonaka 1991, Knowledge Creating Company Creating new important knowledge requires tapping tacit knowledge and often highly subjective intuitions and insights of individuals and making that knowledge available for the organization continuously. When making the knowledge available for the organization, four basic patterns of creating knowledge exist in dynamic interaction, a kind of spiral of knowledge. These phases are: from Tacit to Tacit, from Explicit to Explicit, from Tacit to Explicit and from Explicit to Tacit.	**Porter, 1979, How Competitive Forces Shape Strategy** The competitive environment consists of competitors, underlying economics and classical competitive forces, which are the bargaining power of suppliers, customers, and the threat of new entrants or substitute products.
Von Krogh, Ichijo, Nonaka 2000, Enabling Knowledge Creation Tacit knowledge is sticky, it often remains with the individual who created it. The knowledge spiral contains four interactions that help knowledge creation: originating, conversing,	**Choo, 1997, Organizations as Information-use Systems** To improve scanning, Choo proposes to utilize the specialized knowledge of industry experts, outsource some scanning and use information technology to guarantee variety e.g. using

documenting and internalizing. The knowledge creation process spirals onward between these interactions. A common pitfall of knowledge management is overemphasizing tools and methods. Trust, care and personal networks among employees are the key conditions for spreading knowledge.	automatic searches and retrieval systems, i.e. software agents and push channels. More research is needed on how the information received from environmental scanning is integrated into existing information of the organization, and how tools, resources and people can be combined to form effective environmental scanning process.
Dixon, 2000, Common Knowledge For transferring knowledge, each organization should choose the most effective way, based on the intended receiver, nature of the task and type of knowledge that is transferred. Strategic transfer of knowledge is needed when collective knowledge of the organization is needed to accomplish a strategic task. Strategic transfer is focused on end user needs, and knowledge specialists could be used to interview people and to collect and construct knowledge.	**Pirttilä, 2000, Kilpailijaseuranta** Often organizations are dissatisfied with the available information and analysis of their competitors, mostly because the users needs are not a basis for acquiring the information. Organizations tend to develop processes and decide the scope for scanning based on how they should do it, e.g. in an optimal work environment, without considering the real possibilities to act according to the developed processes. Competitive environment scanning is divided into informal scanning, which is mainly based on informal networks, and systematic scanning, which is based on public information. Efficient scanning requires combining informal scanning and systematic scanning.
Sassoon, Sharon, 2000, Knowledge Stewards Organizations that really recognize the value of their employees' tacit knowledge often use knowledge stewards to capture that knowledge and facilitate its transfer. Knowledge stewards interview and observe people in their work environment to capture what they know, and documenting their learning. People that are interviewed must feel comfortable talking to stewards. Knowledge stewards separate unusable and valuable knowledge.	**Fahey, 2003, Competitor Scenarios** Competitor scenarios are used for understanding competitors' potential moves as well as the potential emergence of new rivals. Scenarios examine in which market segment the competitor will compete, how it competes and what is its target.

especially of environmental scanning. Other researchers have also provided valuable contributions to the topic, especially Pirttilä, who has provided a practical and theory building contribution, e.g. dissertation and book about monitoring competitors, which has provided many good insight about the topic.

Table 6 outlines the key literature used in this dissertation, and their key ideas that have been used in formulating this work. The key literature has been used as background material for starting the thinking process of the topic. Most of the ideas presented in Table 6 are referenced within the actual text in the dissertation.

3.5 Existing Methods and Tools for Acquiring and Sharing Strategic Knowledge of the Competitive Environment

Based on the literature, it is noticeable that descriptions of systematic continuous environmental scanning are rare. In addition, no good summaries of the methods and tools used for acquiring and sharing strategic knowledge of the competitive environment were found. The best–found summary has been written by Keijola, however it focuses on IT tools that support strategic planning (Keijola 2003). Therefore, this section summarizes the methods and the tools that are used for acquiring information and sharing strategic knowledge of the competitive environment.

As acquiring and sharing strategic knowledge of the competitive environment have been investigated by different scholars, it was decided that additional systematic literature research was needed. The literature research is used to investigate the literature broadly without focusing on the ideas of any specific scholar. A broad focus was seen as necessary to be able to demonstrate the uniqueness of the developed construction, e.g. choosing to use environmental scanning as the theoretical approach and therefore reviewing literature with the same focus would have excluded the evaluation of methods presented in marketing related publications. The uniqueness has been demonstrated by describing the challenges in existing methods, which are used to evaluate the methods presented in the literature. Same challenges are also used to evaluate the construction developed in this dissertation. The selected approach completes the literature review and studies that have been made using methods that are more traditional.

3.5.1 Methodology of the Literature Search

The literature search was done in two parts, firstly searching in "Emerald publications" and secondly searching from the whole Internet using the phrase "environmental scanning". The Emerald publications is an electronic marketing channel providing publications published by MCB University Press. To simplify the text, its content is hereafter called as "Emerald Publications".

Several search methods were used: push technology, structured searches with meta-information, established information categorization, increased keyword use possibilities, reduced information space and improved ranking of search results with iterations, to assure a good result quality. Improving relevance was the main reason why a significant effort was put into developing a good search methodology and why several search tactics were used in the process. The used incremental search tactics were:

1. Before the informal and the formal searches, the author was building knowledge of strategic planning, knowledge management, environmental scanning and competitive intelligence through viewing related literature with various focuses, ending up to narrow the focus to sharing and acquiring knowledge for strategic purposes.

2. The informal search was started by choosing the information sources, and relevant information was assured by selecting "Emerald publications" as the information source. "Emerald publications" provides academic, good quality information with various focuses and a fulltext search engine for Internet users, with meta-information fields. The search criterion was built iteratively, and it was then used for formal searching.

3. In the first phase of formal searching, all resulting articles were reviewed, and traditional and innovative methods for knowledge acquisition for strategic planning purposes were categorized. Concepts appearing in the relevant articles, but not typically in other articles, were recognized and recorded, to further use them as search criteria in the next formal searches. In conclusion, the relevance and the reliability were improved by structured searches with meta information, increased keyword use and reduced information space.

4. For the second part of the formal search, the concept "environmental scanning" was used to search articles from the Internet, which led to a reasonable amount of good quality results. The concept was chosen because the phrase is very seldom used in any other context.

3.5.2 Methods and Tools from the Literature

This section presents the methods and tools for scanning the competitive environment, which were described in the literature. The methods and tools are categorized according to the recognized similarities in them, and the challenges associated with them.

3.5.2.1 Group Methods

The following methods use group of experts as an essential part of acquiring knowledge:

- Expert essays are prepared by carefully chosen experts with a topic of particular importance, providing information that is useful to long–range planning. The essays should have a standardized format, especially for outline, length, footnotes etc. (Gordon & Glenn 1994).

- Expert panels are occasions, where a small group of experts discuss and cooperate to synthesize opinions of an important topic. Participants are asked to provide observations and judgments about important developments that are underway, expected and suggested by other panelists. (Gordon & Glenn 1994).

- Delphi is a method of forecasting based on expert opinion and seeking the group opinion through consensus. The method gathers expert opinions on happenings in the competitive environment containing reiteration and feedback after each round. (Van Vuuren 2001; Kaynak et al. 1994; Delphi 2003).

- GSV (Gearing–Swart–Var's) technique is similar to Delphi method, however it does not seek expert consensus. (Kaynak, Bloom & Leibold 1994).

- Delphi Conference is one of the innovations using Delphi method, where a computer system facilitates individuals to communicate rapidly in generating the forecast and forming the group opinion. (Kaynak et al. 1994).

- Think tank is group methodology used for analyzing the environmental context and deciding on recommendations for responding strategies. (Morgan & Hunt 2002).

The positive feature of these methods is the possibility of providing good quality and well-analyzed results. The results can be presented in the form of explicit knowledge and artifacts that are easy to distribute in global organizations. The results can be recent, relevant and reliable, if they are prepared on request when a certain strategic decision needs to be made. If the artifacts are not prepared on request for a specific purpose, their fitness for use might be lower.

Managers' willingness to acquire knowledge through discussions is not considered in these methods, where knowledge is shared with managers using artifacts. The use of these methods requires plenty of time and cost, and therefore they are not suitable for continuous scanning in most organizations. In addition, when using expert panels, Delphi, Delphi Conference and Think Tank, most innovative opinions can be neglected when a group consensus is sought. This means that the results might not facilitate the company to differentiate, and succeed based on the use of non-trivial knowledge of the competitive environment.

3.5.2.2 Traditional Methods and Tools

The following methods and tools have been categorized as traditional methods, as either they are methods that have been described in the literature during recent decades or they can be seen as variants of such methods and tools:

- SWOT is one the most commonly used tools for strategic planning, combining company's external and internal aspects for analysis. SWOT encourages discussion and facilitates it by suggesting issues to consider and analyze (Curry 1996).

- Computer-based SWOT works similarly, suggesting topics, which are either generic or based on data in the information systems, e.g. in executive information systems (EIS). (Curry 1996).

- Trend–impact analysis projects future trends from past information. (Van Vuuren 2001).

- Scenario building and analysis means developing a time–ordered sequence of events bearing a logical cause and effect relationship. The final forecast is based on multiple options, each with its own probability of occurring. (Van Vuuren 2001).

- Competitor scenarios are used for understanding competitors' potential moves as well as the potential emergence of new rivals. Scenarios examine in which market segment the competitor will compete, how it will compete and what is its target. The scenarios can be made either unconstrained (posing any questions) or constrained. (Fahey 2003).

- War gaming is used to experience decision–making in simulated conditions. The method recognizes the importance of identifying alternative courses of action rather than simply one proposal. (Mc Nelly 2002).

These methods are efficient for synthesizing, analyzing and summarizing information of the competitive environment. The methods cannot be used alone to scan the competitive environment continuously, however, they could be part of a bigger framework, as a set methods out of which one or several could be picked. The methods encourage combining business and technology considerations, and reducing the amount of shared information, e.g. by filtering or synthesizing. The information is also integrated with existing information. The methods also improve sharing expertise within the company.

3.5.2.3 Information Systems

The following methods and tools utilize information technology as its essential part:

- EIS (Executive Information System) is an information system storing and providing data for executive managers. (Curry 1996).

- CIS (Competitor Information System) is an information system built, using intelligence, for managing the data of competitors for strategic planning purposes. It is

built after identifying key strategic issues, strategic competitor groups and analysis made based on this information. (Fletcher & Donaghy 1994).

- SIS (Strategic Information Systems) is an information system built to collect and store data for management. Libraries could be collecting this data. (Adams 1995).

Building an information system that is utilized to collect, store and provide data could be an efficient means to manage the information. Such systems must be part of a bigger framework and process to be used for knowledge acquisition, construction and sharing. Such systems are especially suitable in distributed environments, and they could be applicable for continuous scanning as well. From the presented systems, the Strategic Information System could be the best approach, since it is not limited for executive use only as EIS, or for competitor information only as CIS.

3.5.2.4 Frameworks

The following frameworks are wider structures designed to enclose a sequence of several activities:

- Issues management has been presented by Ansoff. It consists of the following phases that were originally presented by William L. Renfro: 1. Issues are defined based on emerging issues are noted based on literature, conferences or Delphi, 2. Issues are evaluated, their probabilities and impacts considered and they are prioritized 3. The top 3–5 consensus strategic issues are selected 4. Strategy is selected (Gordon & Glenn 1994). A strategic issue is an event, change or forthcoming development that is likely to have an important impact on the organization. Diagnosing the strategic issues is central to the whole issues management framework. (Liu 1998).

- QUEST is a scanning procedure helping to share views and to develop a shared understanding of high priority issues, options, eventualities and their implications for organizational strategies and policies. It produces a) a broad analysis of the environment b) assessment of the capacity and strategic options for dealing with the environment. The procedure involves four phases, which are preparation, scanning workshop, intermediate analysis and strategic options workshop. Quest

uses workshops in scanning and assessing the strategic options for the organization. (Gordon & Glenn 1994).

Issues management and QUEST are very attractive holistic approaches, providing a framework to scan the competitive environment. As such, they do not offer solutions to most of the recognized challenges, e.g. combining business and technology considerations or scanning the whole competitive environment instead of only customers, or managers´ preference for using their informal networks as source of information. However, the frameworks do not prevent combining them with methods or tools that would provide solutions for those challenges.

3.5.2.5 Other Methods

The following methods and tools do not belong to previous categories for various reasons, and therefore they are described here as "other methods":

- Hit management means that search results are stored with explanations and shared among other users, agents, push technology and filters. (Wheelwright 2003).
- Government agencies can be contacted and asked to provide data, this can be done with low costs. However use of government agencies to acquire knowledge might be slow. (Malhotra 1996).
- Investment communities can have company data that is not widely available for other users. (Malhotra 1996).
- Surveys and interviews provide in–depth perspective to strategic issues. (Malhotra 1996).
- On–site/drive by observations are used to note visible changes e.g. a competitor constructing a new building, full parking spaces, information on suppliers or customers, etc. (Malhotra 1996).
- Reverse engineering means observing and investigating competitors´ products to understand better their quality and costs. (Malhotra 1996).

- Benchmarking as a research tool has become more popular because it indicates how to eliminate excess capacity, outsource or modify existing processes. Process benchmarking highlights the activities and processes, where the firm has superior performance or cost advantage compared to its competitors. Specific process benchmarking partnerships are established to facilitate the benchmarking. (Ralston, Wright & Kumar 2001).

These methods are efficient when acquiring knowledge of certain issues of the competitive environment. As the methods are quite laborious to use, they cannot be used alone to scan the competitive environment continuously. However, the methods could be part of a bigger framework and process as an additional package of methods that could be used on need basis. Hit management is a method that is well suited for distributed use, and therefore it could be an essential part of the process used for sharing the acquired knowledge in distributed organizations.

3.5.3 Analysis of Methods and Tools

Table 7 presents the frameworks, methods and tools described in the literature and how they utilize humans, computers, or both, in scanning process. Most of the described methods for scanning the competitive environment concentrate on either processing the information by people or processing the information by computers, without combining them. On the other hand, it is noted that most of the methods rightly concentrate on providing analyzed information for the managers, instead of purely acquiring more information of any kind on the competitive environment. In addition, no such methods or tools were found which clearly recognize and focus on the gap between the developed tools and the managers' style of acquiring knowledge.

In addition, currently available computer based tools are not flexible or tolerant; they are incapable of solving or assisting in solving fragmented problems without human intervention for further refinement of the acquired information. This phenomenon has been also recognized by Keijola (2003). Table 8 presents the methods with respect how they influence the challenges that were listed in the Table 1. Table 8 show that the methods can help to decrease or eliminate some of the challenges, however these

methods and tools cannot tackle all the challenges. Therefore, a more comprehensive framework consisting of several methods is needed to improve the overall situation of acquiring and sharing strategic knowledge of the competitive environment.

Table 7. Methods, tools and frameworks proposed or described in the literature, and their relation to using people, computers, or both.

Method	**People**	**Computer**	**People and computer**
Expert panel	X		
Expert essays	X		
Delphi	X		
GSV	X		
Delphi conference			X
Think tank	X		
Hit management			X
Government agencies	X		
Investment communities	X		
Surveys and interviews	X		
On–site/drive by observations	X		
Reverse engineering	X		
Benchmarking	X		
SWOT	X		
Computer based SWOT			X
Scenario building	X		
Competitor scenarios	X		
Trend–impact analysis	X		
War gaming			X
EIS (Executive Information Systems)		X	
CIS (Competitor Information Systems)		X	
SIS (Strategic Information Systems)		X	
Issues management	X		
QUEST	X		

Table 8. Evaluation of the positive influence of the methods, tools and frameworks on the challenges.

FOCUS	Expert panel	Expert essays	Delphi	GSV	Delphi conference	Think tank	Hit management	Government agencies	Investment communities	Surveys and interviews	On-site/drive by observations	Reverse engineering	Benchmarking	SWOT	Computer based SWOT	Scenario building	Competitor scenarios	Trend-impact analysis	War gaming	EIS	CIS	SIS	Issues management	QUEST
Sharing tacit knowledge and sharing expertise	X	X	X	X	X	X								X	X	X	X	X	X				X	X
Continuous and systematic scanning													X							X	X	X	X	X
Full text search methodologies and the Internet, as the source of the competitive environment information.							X																	
Adequate resources for scanning																								
Combining business and technology considerations.	X	X	X	X	X	X																		
Scanning the complete competitive environment, instead of focusing on customers only	X	X	X	X	X	X																		
Filtering information for managers who suffer from info stress	X	X	X	X	X	X								X	X	X	X	X					X	X
Providing summarized, analyzed, synthesized information	X	X	X	X	X	X								X	X	X	X	X					X	X
New information is integrated into the existing information of the organization.	X	X	X	X	X	X								X	X	X	X	X					X	X
Use of strengths of computers and humans is utilized by integrating them into the same scanning process.					X		X								X				X					
Various sources of information, e.g. online information, are used for strategic decision making.																								

3.5.4 Evaluation of the Literature Search

Because the literature search was done in two parts, the first search from "Emerald publications" and the second search from the whole Internet using the phrase "environmental scanning" for searching, so the search space was wide enough. The "Emerald publications" is known as good quality information source, providing reliable information, and therefore the results are considered reliable.

Concept environmental scanning is commonly used for acquiring knowledge of the competitive environment, and consequently its use provided relevant information. However, since it has been used by a limited group of researchers, utilizing it for all searches would have provided too limited perspective for receiving understanding of all available methods. The results are relevant, because the search criterion was developed in iterations, and with an extensive amount of effort. Selected articles were published during the past 10 years; consequently, they are recent enough for this context.

Several methods were used to assure good quality results: push technology, structured searches with meta–information and established information categorization, increased keyword use possibilities, reduced information space and improved ranking of search results with iterations. The use of these methods increases information quality when searching for information with full–text search engines (Gelle & Karhu 2003).

In conclusion, the search results are of good quality. The quality is based on an extensive amount of articles and other articles that were read, based on iterative development of the search criteria, the two different formal searches that were done within two different search spaces, and the various search methods that were used.

3.6 Enhancing Acquiring and Sharing of Strategic Knowledge

3.6.1 Enhancing Acquiring Of Strategic Knowledge

The skills to prioritize, synthesize and find available information are required to manage information and to provide good quality information (Karhu 2001). In strate-

gic planning, managers are asked where they allocate management attention, since all aspects of the competitive environment cannot be scanned and analyzed (Davenport & Beck 2001). According to Hedelin and Allwood (2002), tools and information technology must support allocating management attention to the most relevant points: the required information is retrieved and integrated, and external information is made available in a more consistent and integrated way.

The improvement activities for acquiring and sharing strategic knowledge could be aimed at finding and developing appropriate methods and tools to filter information that would provide good quality of information to the decision–makers. The challenge in filtering information is knowing which change in the environment is significant. The difficulty of filtering has been described by some scanning experiences, e.g. by Pashiardis (1996). Advanced filtering activities are described by some authors, e.g. Xu and Kaye (1995) have proposed that the optimal solution can be a human–computer systematic scanning process that also filters the information. In addition, they describe that more research is needed on how to integrate existing information into results of the scanning. (Choo 1997; Correia & Wilson 2002).

Typically, articles describing information management systems explain how to acquire strategic information, neglecting to describe human scanning activities. On the other hand, articles describing human activities in planning strategy neglect combining computers into the process descriptions. Therefore, a clear gap in the descriptions is identified. The combination of internal and external information calls for humans to process the information – such activities would be too complex for computers to perform successfully.

The best filtering of information, that is filtering that can provide good quality results, happens through humans, who summarize information, highlight, interpret and provide rich, nuance communication. Human superior performance in filtering is based on the need for expertise in the topic in order to recognize correctly which piece of information and which change in the environment is significant.

In addition to advanced filtering practices, good information sources are needed. As the goal is to outwit and outperform competitors, scanning by utilizing traditional

sources is not good enough; the possibilities provided by the Internet are to be used, as the Internet is the richest information source of the future. To beat the competition, information should be utilized better than the competition is able to do.

3.6.2 Enhancing the Sharing of Strategic Knowledge

Another gap is identified in the articles describing environmental scanning or strategic planning:

- Articles describing information management systems do not recognize that managers making strategic decisions do not in practice use such information management systems, and therefore they do no recognize the importance of knowledge sharing between users and managers.
- Articles describing strategic planning do not describe the use of IT based tools since busy managers do not have the time and skills to use such tools. Therefore, these articles also neglect the importance of knowledge sharing.

Besides the gap in the descriptions, existence of the same gap in current practice is demonstrated by the fact that executives do not name competitive intelligence as one of the tools that they use in strategic planning (Tanner, Haapalinna, Seppälä, Stenfors & Syrjänen 2004).

To improve scanning, Choo (1997) proposes utilizing the specialized knowledge of industry experts, outsourcing some scanning and using information technology to guarantee variety e.g. using automatic searches and retrieval systems, i.e. software agents and push channels. Traditionally, company librarians or separate competitive intelligence functions have been used to scan the competitive environment. In addition, some organizations have started to use specialized analysts, e.g. by utilizing one of today's trends and outsourcing the information analysis to analyst teams in India. However, these companies still seem to lack the essential understanding to combine these analyst activities into effective knowledge sharing activities between the analysts and managers making the strategic decisions.

Underwood and Breeding suggest that sharing and discussing knowledge of the competitive environment can be enhanced using information management systems, e.g. portals or LN (Underwood 2002; Breeding 2001). However, it is important to notice that the knowledge expert acquires is tacit knowledge, and such knowledge is difficult to share. Sharing the knowledge requires that the knowledge is first transferred into explicit knowledge and later on combined with reports, etc. Therefore, other forms of knowledge sharing are needed as well; e.g. discussions between managers and experts.

When considering the possibilities of enhancing the acquiring and sharing strategic knowledge, it has to be kept in mind that for a lean enterprise, lack of resources for establishing a separate business intelligence function demands that acquiring knowledge must be integrated into other processes and into the decision making system, e.g. into strategic planning (Womack & Jones 1994). Therefore, practices that would suit such integration need to be developed. Too often organizations select and describe procedures, that should be done in an optimal resource situation, and do not realize that the plans will fail because of the lack of resources that can be used for performing the planned activities.

4 CONSTRUCTION FOR ACQUIRING AND SHARING OF STRATEGIC KNOWLEDGE OF THE COMPETITIVE ENVIRONMENT

The objective of the dissertation is to develop a framework including appropriate methods and tools for acquiring and sharing strategic knowledge of the competitive environment, which will be used for strategic technology planning purposes. In addition, continuous scanning, as focused on opportunity finding and contributing proactively to the organization, has been selected as the construction approach that fits well with a dynamic competitive environment and continuous strategic planning.

Until now, knowledge management literature and environmental scanning literature has been presented, with the purpose of understanding the acquiring and sharing of strategic knowledge of the competitive environment. The challenges in current practices of scanning the competitive environment have been listed, and the current practices used by different organizations have been described. It has been noted in particular that existing practices do not combine computers and humans into systematic scanning process, and that managers are not actually using information systems to scan the competitive environment. Managers rather acquire their knowledge from their informal networks. This chapter briefly describes the developed construction that enhances the acquiring and sharing of strategic knowledge of the competitive environment, and its connection with the existing literature.

In the first sections of this chapter, the developed framework for sharing expertise, the Expertise Cycle, is described. Afterwards, the framework for acquiring and sharing strategic knowledge is presented in more detail, the Strategic Knowledge Cycle, and especially its application for strategic knowledge of the competitive environment.

As discussed earlier in this chapter, environmental scanning literature describes that the best filtering of information resulting in good quality information happens through humans. The humans filtering the information have a similar role to knowledge stewards, as described in the knowledge management literature. Therefore, the proposal is to combine the ideas of environmental scanning and knowledge management to create

a construction, where knowledge stewards acquire, collect, filter, create, document, store and share strategic knowledge of the competitive environment.

Acquiring and sharing strategic knowledge of the competitive environment using external knowledge stewards is appropriate, due to the tacit nature of knowledge, its distributed form, and, most of all, because strategic knowledge is so important to the company that additional associated costs are justified. Besides documenting strategic knowledge, the experts need to become familiar with the managers, becoming part of their informal network. Experts should be known as competent, reliable and trustworthy discussion partners. This is very important, since, for managers making strategic decisions, it is extremely important to know people they can trust enough to ask for information discretely. The importance of establishing networks for sharing information on the competitive environment, the importance of the perceived credibility and trustworthiness of deliverables and persons sharing their knowledge has been discussed by some publications, e.g. (Prescott 2001; Prescott, Herring & Panfely 2001).

4.1 Features of Strategic Knowledge of the Competitive Environment

Strategic knowledge of the competitive environment is an overview, a holistic view, of the whole competitive environment. Therefore, acquiring this strategic knowledge requires an extensive knowledge base as a starting point, to form opinions about the competitive environment and to intuitively and successfully analyze new issues and recognize which change in the competitive environment is important. Seeing the whole instead of separated details, and seeing interrelationships instead of static snapshots are needed. In addition, knowledge of the competitive environment is very difficult to describe because of the subjective opinions and future predictions that are attached to it, and prognoses or conclusions that are not often verbalized or analyzed. Therefore, it is concluded that strategic knowledge of the competitive environment is one form of expertise, and descriptions of acquiring and sharing expertise apply to acquiring and sharing strategic knowledge. As the expert and manager acquires new strategic knowledge, so his own expertise grows.

As discussed, describing strategic knowledge of the competitive environment is difficult. On the other hand, in a global organization knowledge of the competitive environment is distributed to several people, each knowing only a minor part of the whole, and each of these persons are in different locations. Consequently, sharing, collecting and analyzing the knowledge of each of these persons is very important in acquiring adequate knowledge to be utilized in successful strategic decision making. However, as most of the experts are not motivated and skilled in documenting their own knowledge, or they do not have time for it since they prioritized other tasks, knowledge stewards can be used to document their knowledge.

4.2 Expertise Cycle, Framework for Sharing Expertise

As stated earlier, success requires the best market information and the ability to react to it quickly. Therefore, the competitive environment needs to be scanned continuously and systematically. Experts, knowledge stewards, are used, since managers, who do not have enough time to scan the competitive environment themselves, typically acquire knowledge by asking questions from other people they trust and are in contact with, and who are capable of understanding the business and technology aspects. Consequently, the goal for the framework is to compress distributed expertise and to make it accessible for managers and other employees by converting it to explicit knowledge.

The Expertise Cycle is used as a framework to describe the process of how experts acquire and share knowledge among the experts, see Figure 2. Knowledge stewards interview other experts to document their knowledge, their behavior and parts of their reasoning, and their internal models. Knowledge stewards form their own internal models of the issue and document them, converting them into explicit knowledge, e.g., into written descriptions and instructions. A feedback loop with the experts assures the quality of the content. Other people learning about the topic, knowledge seekers, can easily use the resulting explicit knowledge, and with their own experiments create their own mental models about the issue. The phases of Expertise Cycle are called a) knowledge acquisition, b) knowledge construction, c) information distribution and d) information interpretation. (Karhu 2002).

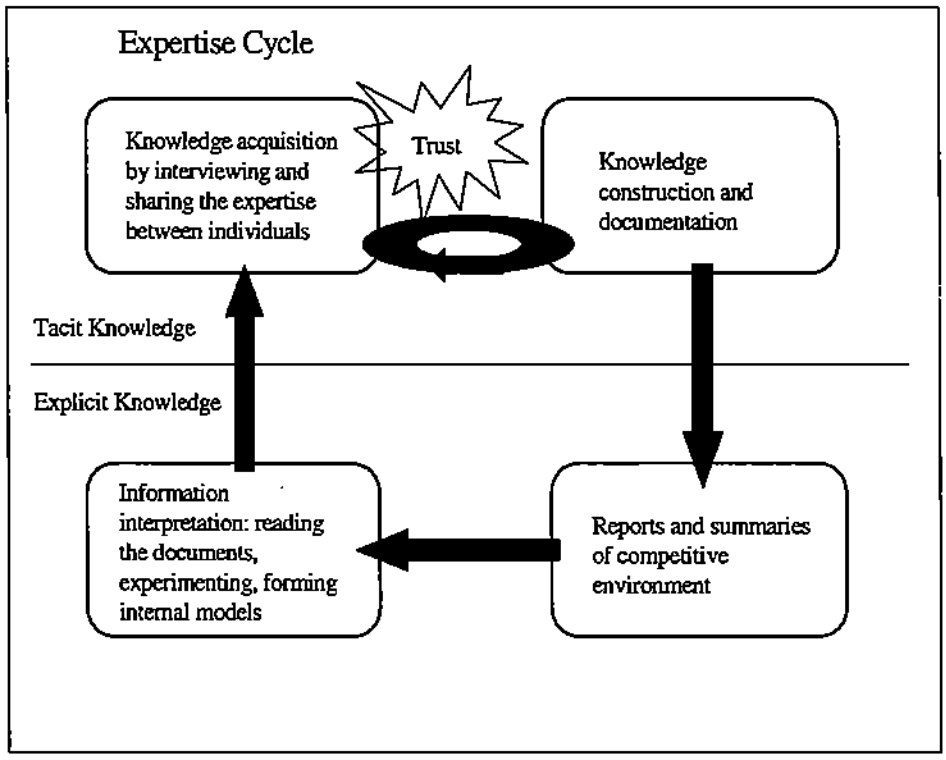

Figure 2. The Expertise Cycle is used as a framework for creating and sharing expertise.

The Expertise Cycle resembles the knowledge spiral presented by Nonaka (1991) and later Von Krogh et al. (2000). The knowledge spiral presents knowledge creation interactions in an overall enabling context: originating, converting, documenting and internalizing the knowledge. The main differences between Expertise Cycle and Knowledge Spiral are the emphasis on knowledge sharing vs. knowledge creation, the type of knowledge, physical location of the knowledge and the amount of owners of the original knowledge. The Expertise Cycle concentrates on knowledge sharing, instead of knowledge creation, it discusses sharing expertise that is typically distributed among different people and in different physical locations. The Expertise Cycle, its theoretical background and its use for two different purposes are further described in article 2. (Karhu 2002)

4.3 Strategic Knowledge Cycle, Framework for Sharing Strategic Knowledge

This dissertation proposes that systematic and informal competitive environment scanning for strategic technology planning should be done in complementary parts of the same framework, called the Strategic Knowledge Cycle. The phases of the Strategic Knowledge Cycle are connected by experts belonging to the informal network of managers. See Figure 3. The Strategic Knowledge Cycle is similar to the Expertise Cycle with the main difference being that the managers use discussions with the informal networks alongside explicit information in order to acquire strategic knowledge. Pirttilä (2000) has divided competitive environment scanning into two parts:

- Informal scanning, mainly based on "mouth to mouth" information and informal networks
- Systematic scanning, based on public information available in the competitive environment.

Therefore, the Strategic Knowledge Cycle resembles the framework provided by Pirttilä. However, it adds the steps of scanning the competitive environment and their description, based on the knowledge management approach, and it adds actors performing these steps. The Strategic Knowledge Cycle is drawn from the organizational perspective. The cycle would look different, if it were drawn from the experts' or managers' perspective. For example, the cycle from the expert perspective would resemble the Nonakas SECI model. (Nonaka & Takeuchi 1995).

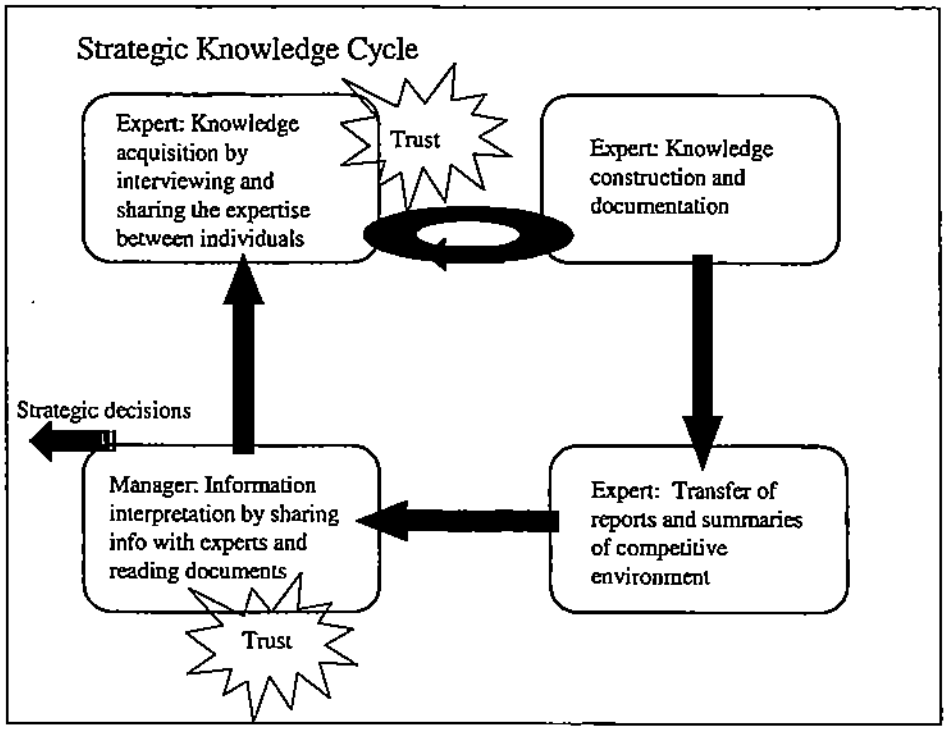

Figure 3. Strategic Knowledge Cycle presenting how strategic knowledge is constructed and transferred.

In short, the phases of the Strategic Knowledge Cycle are knowledge acquisition, knowledge construction, information distribution and information interpretation.

- Knowledge acquisition: experts scan the environment systematically, using advanced tools, interviews and knowledge-sharing between experts. They learn by using given methods and tools, their personal creativity and learning skills.

- Knowledge construction: experts externalize, analyze, summarize and document the knowledge they have based on the knowledge acquisition phase. Experts analyze and synthesize the information, considering which piece of information is significant.

- Information distribution: explicit knowledge in the form of artifacts, e.g. reports and summaries, is constructed, published, transferred and shared. Experts analyze and synthesize the information, considering to which issues managers should give their attention. The distribution of information happens

through discussions, electronic and paper reports, but also with modern portals. Using portals enables people, e.g. experts and middle management, in distributed locations, to acquire knowledge and understand better the strategic decisions made by top management.

- Information interpretation: managers acquire knowledge about the competitive environment by sharing strategic knowledge with their informal networks and reading the artifacts. Trust and other relational dimensions of relationships are important for managers to receive the correct information. Therefore, the experts should be part of the informal networks of the managers in order to be used as sources for strategic knowledge.

4.3.1 Knowledge Acquisition and Construction

Experts scan the competitive environment systematically and constantly. They interview different experts and use competitive intelligence tools, especially tools based on modern full text search engines, to acquire information from the Internet. When the experts interview other experts, the aim is to document their tacit knowledge, behavior, reasoning and internal models. Trust and personal relationship with people interacting in the interview are the basis for good results for knowledge acquisition. Information from the news providers, patent databases and from the competitors' Internet pages are automatically scanned by advanced competitive intelligence tools, and the filtered information is forwarded to the expert or to a portal used by the expert. Because of these automatic features, experts have more time for interviews and knowledge construction.

As a result of the interviews and the information provided by the tools, knowledge construction begins. The experts form their own internal models of the issue, document their knowledge and analyses, transferring them into explicit knowledge. The tools are used to search for information on certain interesting issues that have significance for analysis, e.g. actions from certain competitors related to acquiring new markets or patenting for important pieces of emerging or key technologies.

Knowledge construction requires good skills for expressing the knowledge through documentation, but in addition it requires a broad view of the whole competitive environment, enabling the expert to filter the information based on a view about which piece of information is not significant, and to what issues managers should allocate their attention. Managers must know the experts beforehand, in order to recognize them as reliable, knowledgeable and trustworthy persons.

Experts need to use various information sources, e.g. interviews with other experts, on–line information databases and the Internet to develop their own expertise on the topic, and to assure that variety of information is used for strategic purposes. In addition, knowledge stewards need to document their knowledge, paying special attention to mentioning used sources as reference, and providing links to additional recent, relevant and reliable information sources that can be used for additional information on the topic and for analyzing the reliability of the material. Using references and links, managers are able to evaluate the reliability of the provided information, and themselves seek more information.

4.3.2 Information Distribution and Interpretation

Experts analyze and synthesize the knowledge, constructing explicit knowledge, taking into account what are the issues to which managers should allocate their attention. Experts distribute the constructions using artifacts, in explicit knowledge, enabling individual tacit knowledge to become organizational knowledge. Reports were earlier used as one of the most important forms of explicit knowledge, however nowadays reports are often replaced by power point presentations. This is unfortunate if presentations mean loss of exposition and loss of right level of detail, which would be needed to judge the usefulness of the information. Other people learning about the topic, knowledge seekers, can easily use the resulting text and their own experiments to create their own mental models about the issue, if the information is distributed with a well–planned process and tools, e.g. publishing information using intranet portals.

The information available for knowledge seekers is distributed into different locations, with the name of the author, and consequently knowledge stewards are likely to be

contacted by other experts that they have not been in contact with before. The network of experts the knowledge steward can use for his future interviews is therefore increased. As the experts have already established trusting relationships with the managers, during their discussions that are organized monthly, weekly or on demand, experts share their knowledge with managers. Besides the discussions, reports and references to good information sources are provided. They can be provided using portals, which is a practical way to provide information, since it allows the storing information in a structured way and updating the content when new information appears. During discussions, experts receive feedback on which part of their knowledge is considered interesting and important, and therefore they are able to improve their own knowledge creation, filtering and analyzing practices.

4.3.3 Summary

This dissertation discusses acquiring and sharing strategic knowledge of the competitive environment, knowledge that is of good quality, and hence used for strategic purposes. In the following description, the abbreviation T represents tacit knowledge and E represents explicit knowledge.

To be successful in making strategic decisions, the internal information and the external information should be utilized. Especially important is to utilize the expertise distributed to several experts within the company. The target of the knowledge sharing is presented below.

Experts	*Manager*
T →	T

The challenge in sharing the knowledge as presented above is that sharing tacit knowledge is a difficult and time–consuming task. On the other hand, managers would need to benefit from the knowledge of several experts. As managers are typically much occupied with several issues, they do not have enough time to acquire knowledge as presented above.

Some literature recommends that tacit knowledge should be shared by requesting the owner of the tacit knowledge to document it. The documented knowledge would be shared using artifacts. The process is presented below.

Experts	*Expert documents*	*Manager*
T →	E →	T

The challenge of the previous model is that experts are seldom motivated or skilled to document their tacit knowledge – as documenting tacit knowledge is a very demanding task. Therefore, despite the requests, the knowledge is left undocumented. To address this challenge, some literature proposes the use of knowledge stewards to acquire knowledge from the experts through trusted relationships and to interact with them, e.g. using interviews and doing things together. The knowledge steward then converts his tacit knowledge into explicit knowledge and documents it.

The knowledge is shared with managers using discussions, during which the manager has the possibility to ask questions. Partly the knowledge turns into explicit knowledge and partly into tacit knowledge. Especially the conversion into tacit knowledge happens through internalization of the knowledge when making the strategic decision and following the outcomes of such decisions. The framework in this dissertation is presented below:

Experts	*Knowledge steward*	*Knowledge steward converts and documents*	*Manager and knowledge steward*
T →	T →	E (& T) →	T & (E) →

The knowledge steward acquiring the knowledge and sharing it with managers should receive feedback on how useful the knowledge was in the decision making; and consequently he/she is able to understand the information needs even better, and will be able to provide even better quality of information next time. This is especially important since the target is to provide methods and tools supporting continuous scanning through continuous strategic planning. The selected form for knowledge acquisition and knowledge sharing, the Strategic Knowledge Cycle, enables such a feedback loop.

4.4 Business Technology Portals

Business Technology Portals (BTPs) are knowledge acquiring and sharing portals, providing single point of access to all business and technology relevant information for a certain business. Construction includes usage of portals similar to Business Technology Portals to facilitate sharing and acquiring knowledge. Business Technology Portals contain

- information, typically summaries and analyses, written by different experts, with the help of questions guiding the consideration of similar issues and use of a standard form in documenting the knowledge (method similar to expert essays 3.5.2.1 Group Methods)
- information provided and filtered automatically by the full–text search engine, e.g. from news services
- advanced customized tools that can be used to acquire more information, e.g. from competitors´ pages
- links to other relevant information sources, picked by the experts (method similar to hit management 3.5.2.5 Other Methods).

The Business Technology Portals are customized to provide information on the business unit, using the capabilities of modern full–text search technology and some other more simple methods. The customizations are based on the names of the competitors, names of the main customers, and names and short descriptions of the key technologies of the unit. In addition, a patent search profile is built to filter information related to the published patent applications.

Business specific news is presented on the front page. The content in the portals is divided into four categories, Customers and Market, Competitors, Technologies and Tools. The Customers and Market category is further divided into subcategories, e.g. Market Segments, Market Channels and Key Customers. Competitors are divided into subcategories like key competitors, challengers and substitute products. The Technology category is divided into subcategories like Key Technologies, Emerging Technologies and Patents. The subcategories Key Customers, Key Competitors and Challengers contain a page or pages for each of the companies, presenting basic data

about the company, SWOT analysis of the company, company specific news feed and analysis of the competitors' products and the competitors' patent portfolio. If possible, also a list of key persons is included, e.g. experts mentioned in the patent applications or experts presenting important scientific findings in conferences.

The tools for acquiring more information, e.g., customer, competitor, technology and article search tools were built. In addition, tender search tools, news storage search tool and patent search tools were built.

As described, experts use the Business Technology Portals as the source of competitive environment knowledge when scanning the environment. In addition, the experts use the portals to document their knowledge, e.g. writing summaries of different competitors, concentrating on explaining important changes and how they could be capable of threatening the position of the business unit or what kind of significant new opportunities they could create for it. This information is then usable, in addition to the technology managers and other managers, also for other experts and information seekers within the global corporation.

4.5 Information Sources for Scanning the Competitive Environment

Since technology is considered an especially important driver for strategic change when creating the technology strategy, this dissertation proposes and explains, besides traditional information sources, use of information sources that can be used to scan the key and emerging technologies of a business unit. This is important since using standard industry information sources will not help the company to beat the competition. The need to beat the competition has been described by Fahey (1999), who claims that detecting, anticipating and understanding the environment is the basis for outmaneuvering and outperforming the competitors

Quality of results depends very much on choosing good quality information sources to be searched. In addition, the methods to be utilized by the search engines need to be adjusted to the selected information source.

Current search engines have significant weaknesses, e.g. constructing search queries, arranging results and isolating specific types of documents are difficult tasks (Kline 2002). This construction promotes customized search engines, as a means to provide good quality information and ease the difficulty users have searching for it. The construction helps users in constructing search queries and finding the good quality information. Finding good quality information is facilitated by selecting good quality information sources for the customized search tools. Constructing search queries is helped by tools where the user is able to view information based on a tree form categorization of all the search results and from which the user is able to start further searching in a specific part of the tree structure. The following information sources are used: news, company Internet pages, patent information and other Internet sites.

Internet based information sources are used as the information source for the competitive intelligence tools, e.g. news portals and company internet pages, as well as scientific articles and information provided by different associations. These information sources are selected based on careful evaluation and analysis. For example, news providers are chosen based on the quality of the content (recent, relevant and reliable), as well as the existence of categories of news that suits the organization. Ready categorization of the news is appreciated, since categorization of the information correctly is extremely difficult. The expert selects the sources for technical information. Search engines are used to find more information sources that are similar to the information sources that the expert picks, since it is assumed that even experts are not always aware of all the good information sources.

4.5.1 News

News providers, e.g. Reuters, offer their own news and some providers offer categorized news combined from several news providers, e.g. industry news category, which contains subsections for utilities and the chemical industry. News is provided daily, and often updated several times a day – consequently news is recent information. News is provided by companies known for high quality newspapers and the same information is available on the Internet; consequently, Internet news is reliable infor-

mation. The relevance of this information depends on the context; e.g. company is interested in the news of their own markets.

Therefore, it is concluded that the quality of Internet news is good and it can be used for scanning the competitive environment. Use of news and tools that support the competitive environment scanning are described next.

Daily news is presented to a user via portal pages in the Intranet, according to the information categorization structure. Business news is presented on the front page, where users can see the overall picture of new issues in their business area immediately when entering the portal. Daily news is built by utilizing the existing categories of news providers, presenting headlines and links to the latest pieces of news on the portal page. Since more than ten pieces of news typically appear for each specified business field daily, links to the latest pieces are presented. Consequently, only the most recent news can be found by observing the front page.

Scanning the technologies through the news is more difficult. The following obstacles have been recognized:

- Keywords that describe the technology are difficult to choose.
- Normal news providers, e.g. Reuters, do not present the technical breakthroughs. More sophisticated news providers have to be used for presenting technology news.

Proposal is to download news from a news portal, which presents news from various sources and categorizes it. The latest news is presented on the front page of the portal with a link to a search tool that enables users to search the news archive. The search tool arranges news either in order of relevance or in order of recentness. Users can limit their searches to a specific period. The search results are presented with a title and with automatically generated short summary, containing a link to the entire text.

Daily news and news storage enable users to:

a) scan the competitive environment daily

b) search for specific information from the news archive.

Since users often want to focus their attention on a certain competitor or customer, a news categorization feature is created. Competitors are already categorized in the portal into different competitor types, e.g. key competitors, challengers and start–up companies or to competitors in engineering or competitors in services. Therefore, the news is first divided into these main classes and furthermore into competitor type subclasses. The users are able to view the news through the tree structure and to search for pieces of news within a certain category or subcategory. In addition, special categories can be included, e.g. acquisitions or patents, to monitor the latest important technology news. News categorization facilitates a better way to monitor the competitors through news.

The presentation order of news can be arranged according to certain competitors or periods. Based on this structure, users are able to receive a news notification of the latest news, e.g. weekly news summaries of all the customers or competitors of their interest. Sending a notification activates the users to scan the competitive environment. Without a reminder, the users are occupied with other issues and will not enter the portal.

4.5.2 Company Internet Pages

Competitors and customers offer much information about their products and activities on their Internet pages. However, better ways to use this information should be found.

To utilize information on the company Internet pages, search tools that search competitors or customers Internet pages is needed. The search space is restricted to the company domain or even a small section of it. Each search tool contains a set of companies that can be searched at the same time or separately, e.g. searching for information on a certain technology or customer from the Internet pages of a competitor. Idea is to enable fast searching of certain piece of information from several sources, e.g. searching with the name of the key technology, experts are able to scan fast what the competitors and customers are stating about the technology in their Internet pages. Alternatively, cooperation between companies, e.g. two competitors or between a competitor and a customer could be recognized because of issues mentioned either in the news or on the Internet pages of the companies. Building a separate search

tool for searching in company Internet pages is important for two reasons: since many companies manipulate the search engines that are in their Internet pages by giving higher priority to information that they want to show, e.g. press release, more objective search results can be found by building our own search tools. By searching for the same issue from several competitors at the same time, users are also able to find the results needed fast, consequently saving time and money.

Scanning changes in the Internet pages is easy if the search tools are built by indexing the competitor Internet sites using full-text search engine, e.g. Verity. Indexing the sites daily enables comparing the indexes over two days, and therefore indicating the changes that have been made. However, according to experience, following the changes in the Internet pages do not interest people scanning the competitors.

Since most of the information provided in the company Internet pages is not typically interesting for competitive environment scanning, only financial reports can be scanned. Financial reports are searched, e.g. annual and quarterly reports, and they are presented in the portal on the competitor pages automatically. Since financial reports are typically named alike, they are easy to recognize with the search engine.

4.5.3 Patents

Not all the information on competitors' future actions can be found on their Internet pages; some part of the future direction is kept a secret. The information in the patent databases is utilized to reveal these secrets.

The patents are downloaded from a commercial Internet service and inserted into a well-structured database. For scanning patents, a patent scanning profile is created with a patent attorney or patent officer, and afterwards this profile is used to dynamically present the latest information from a database. This information can be viewed according to certain predefined analyses, e.g. companies, or subcategories of technologies. Each view enables users to go deeper into the information structure, finally presenting the full patent.

The patents are to be monitored weekly. Therefore, the users can weekly monitor the latest patent applications, and receive notifications of new patents in a certain key technology based on registration. Although the information collection process and a big part of analyses are automated, the final analysis "What does this mean to us?" has to be done by the experts.

4.5.4 Technical Information

Scanning technology development is difficult to automate; often no prominent source of information for a given technology exists on the Internet. Information on a technology is rather scattered in the individual Internet sites of researchers, universities, and research organizations or company R&D departments. Consequently, the first step is to manually search the Internet to find relevant pages and evaluate the quality of their content. After identifying the correct sources, either they can be linked into the portal or a similar search tool can be built to what is used to search competitor Internet sites.

4.6 Methods and Tools

This section summarizes the methods and the tools that are part of the construction. Tools are instruments used to support and realize the developed methods in organizations, and they need to be customized for the competitive environment of each business and for the available information technology. Therefore, the tools that were developed as part of the study are presented as examples, they cannot be directly replicated. The following tools were built:

- Customer search, competitor search, technology search and article search tools
- Tender search, news storage search, patent search and customer complaint search tools
- Competitor, patent and technology search tools
- Online news and patent filtering and classification tool
- Mail tool and portal search tool.

The proposed methods have been developed with strategic technology planning in focus; they are listed in Table 9. The focus has mainly an influence on defining the competitive environment to contain technology aspects, and to finding methods and tools that also support scanning technology developments, e.g. scanning news focusing on technology and finding good sources of technical information from the Internet, as described in this chapter. In addition, knowledge steward is selected from research organization hosting very competent people, and selecting a knowledge steward who understands business and technology aspects of the competitive environment.

Table 9. Methods included as an essential part of the framework.

Method
Using knowledge stewards (experts) to acquire and share strategic knowledge. The knowledge steward should master both the technology and business aspects.
Knowledge stewards as part of the informal networks of managers, creating a trusted relationship.
Using the Expertise Cycle in acquiring and sharing expertise among experts.
Utilizing issues management, expert essays, SWOT, trend–impact analysis, competitor scenarios and hit management when acquiring and sharing strategic knowledge.
Using knowledge stewards to combine internal and external information (summarize, highlight, interpret etc).
Combining experts and computers into the same scanning process, utilizing the strengths of both.
Building portal providing single point of entry for different information sources that are relevant for a business, e.g. business and technology aspects.
Customizing the portals for each business, utilizing information that is easily available, e.g. names of key customers and key competitors.
Acquiring information from the Internet using modern full text search engines, e.g. using news, company internet pages, patents, organizations.
Searching and recognizing quality information sources from the Internet.
Methods to assure good quality information.
Building news and patent storage that allow using full–text search.
Building filters for information, e.g. patent and news filters.
Categorizing and summarizing information automatically.
Utilizing notification and personalization to activate users.

5 EMPIRICAL RESEARCH

This chapter describes the empirical research that has been made in the case company. First, the development work done within the Business Technology Portals project is explained. Then, the deployment and use of the construction in the case company is described, with examples of the tools and the methods used to implement it.

5.1 Background

In the case company, technology review meetings are arranged to discuss the technology strategy yearly/bi-yearly for updating or confirming the existing technology strategy. The goal of the technology review meetings is to discuss and decide on the strategic initiatives into which the business units should direct their technology investments. However, the first review meetings were mostly used by the business units to brief the current research and development activities and to explain how well the unit was doing. Problems, current challenges, threats or trends in the competitive environment were rarely presented to the technology management of the corporation.

However, the target of the technology review meetings was much more ambitious, the discussions between managers could lead to fruitful innovations or decisions. The benefits of the discussions in the technology review meeting need to be seen as worthwhile in revealing the weaknesses of and threats to the unit. Therefore, improvements were needed.

5.2 BTP Development Project

The Business Technology Portals project was initiated in 2000, on the request of the case company technology management to develop appropriate methods and tools, which would support scanning of the competitive environment. The BTP project was funded by the technology management through the corporate research programs. The project team was international with Swiss, German and Finnish participants, mostly located in their respective countries.

In the beginning, the requirements were discussed and agreed with the technology management. One of the first decisions was to develop a portal platform, which would be used to generate applications for different business units. In addition, it was decided that the tools should be built to help users in searching for and finding good quality information. The project started up with a technology–orientated prestudy, in which the possible technologies that could be used for the purpose were reviewed and analyzed. Based on the analysis of full–text search engines, the Verity full–text search engine was purchased and deployed as a part of the corporate Intranet.

As result of the technology prestudy for the portal, the LN intranet with Verity full–text search engine was selected, because the existing infrastructures contain servers and databases around the world, and because of some additional existing services like user administration and information security issues. In addition, the selection of the LN intranet provided a common look and feel with other applications that the managers and other users were already familiar with. The selection enabled license–free deployment. Consequently, the development and the customization of the portals were fast and flexible, and could be done within the available budget. However, the selection was difficult, since it also meant compromises to the user interface and lack of certain advanced technical features that were available in the other platforms.

The author of the dissertation joined the project team in mid–2000. While most of the project team concentrated on analyzing different technologies for selecting the best portal platform, the author focused on developing the overall framework for acquiring and sharing the strategic knowledge of the competitive environment. Experimenting with what kind of information could be found from the Internet and the possible information structure within the portal was also investigated by building prototypes.

Time prevented the managers themselves from acquiring knowledge, e.g. using modern tools themselves and interviewing all the relevant experts. The Technical Writing process for sharing expertise had been established earlier and deployed by the author, and the Business Technology Evaluations process was another good example of how the expertise could be acquired and shared within a global corporation. A similar approach for utilizing experts to acquire and share expertise was selected for

the technology reviews, together with the technology management of the case company. Therefore, as managers typically acquire information from their informal networks, the approach of using experts to acquire and share the information of the competitive environment was selected. The selection was based on the good experiences from a similar process used in Business Technology Evaluations, the nature of the knowledge to be shared, and the distributed knowledge sources.

During the first half of the second year, the actual development started with three pilots, with two business units, and with one demo portal for marketing purposes. Another goal of the demo portal was to provide access to some competitive environment information to the people that did not have access to any of the business unit specific portals.

The technology management of the corporation supported the project team by explaining their experiences and best practices, and they marketed the developed methods for the technology managers of different business units. In the middle of the second year, the technology management sent out information on the utilized process for the next technology review meetings, requesting the business units to scan their competitive environment using help provided by the Business Technology Portals and experts from corporate research. The experts could be used as knowledge stewards for acquiring, synthesizing and analyzing the information.

Some new members were added to the project team, and the team was divided into two parts. The first part developed the information technology solutions for the portal and for the associated tools, and methods to scan the competitive environment. The other part deployed the portals for the business units, created supporting material, and developed business specific methods to scan the competitive environment together with the users. The teams were in daily contact, despite the distribution of members in different locations. Ideas and specifications for the functionality were developed in cooperation, as well as testing of the new functionality. The two pilots and the demo portal were used to enable fast feedback for the project team and to validate the usefulness and the usability of the developed methods and tools during the first half of the second year.

The pilot customers, as well as the next customers, were active in providing feedback. Twice during the one and half year period of developing the portals, the customers were sent an email encouraging them to provide their improvement ideas for the portals. The received improvement ideas were collected and analyzed during a workshop. In addition, the development team members provided their own ideas on how the tools and the methods should be developed. Based on the analysis, the ideas were categorized into issues that were to be done immediately and issues that needed further analyses, and also issues that were to be postponed until the first category of ideas was completed. The ideas were categorized considering the estimated value versus usefulness of the ideas, and the estimated work effort.

In addition, significant effort was put into creating good supporting material for the persons first responsible for deploying and promoting the portals in their organization, and for supporting the users of the portals. Frequently asked questions and their answers were collected. All the information was available from the portal pages and as power point attachments. In addition, the use of different good quality information sources was promoted by presenting them with links and the summary of their content.

5.3 Improved Technology Review Meetings

The technology managers of the corporation scanned the competitive environment, with the help of experts from corporate research, trying to challenge the general managers and the technology managers of the business units to think of the future and the available options more thoroughly, innovatively and strategically.

The experts from corporate research were given the task of scanning the competitive environment and to recognize the most important trends and issues that could affect the business unit. The experts whose skills and competence in the specific field were recognized by the business unit management or group technology management, or experts recommended by the corporate research managers were selected to the support technology review meetings. Experts were dedicated full time during technology review meeting preparations to acquire knowledge, and further analyze and formulate it. However, since they had advanced tools that save time in scanning different

information sources, they needed less time than before in acquiring information. Therefore, the experts had more time to share, to synthesize, analyze and summarize the information and to construct the knowledge. In addition, the findings were based on the interviews of other experts within the company, and externally.

Business Technology Portals were built to help the experts scan the competitive environment using the tools available from the portal, and to share their analyses and the summaries. The experts were guided to provide good reports by templates and good examples. Discussions before the meeting contained presenting the acquired knowledge of the competitive environment to the group technology management and to the technology management of the business unit, in order to receive feedback on the relevance of the presented top issues and to form a consensus on which were the most significant issues for the success of the organization.

The three most important issues were selected for further analysis. This part of the used process resembles the issues management method described in section 3.5.2.4, Frameworks. For synthesizing and analyzing the knowledge of the competitors, the experts often used SWOT analysis, and trend impact analysis, which are described in 3.5.2.2, Traditional Methods and Tools.

Afterwards, during the rest of the year experts continued to scan the competitive environment and especially changes and trends, recognizing what is important, and reporting their important findings to managers, e.g. bimonthly or on a need–basis.

5.4 Deployment Examples

This section presents experiences and learnings from deploying the Business Technology Portals, associated tools and methods in the business units around the case company. All together there were 10 portals deployed by the business technology portal project team, before handing over the developed framework, tools and methods to a business consulting unit within the case company. The described cases have been picked as typical examples to represent the deployments, with successes, but also with some challenges and problems with various aspects as well. Nine of the 10 portals that

were deployed in the business units still exist after approximately three years of starting up their deployment. However, in most cases not all parts of the planned content is actively updated, due to lack of time of the people assigned to maintain the portals. Next, three examples of the deployments are discussed in further detail.

5.4.1 Example 1

The first pilot portal was built containing all the information on key customers, key competitors, challengers and key technologies, etc. The deployment was done in close cooperation with the technology manager of the business area, who mainly acquired and entered the content of the portal. He used the portal to publish results from the investigations and analyses he did himself, e.g. using the tools from the portal. He also initiated some investigations made by the corporate research experts, e.g. related to certain competitor actions and forecasted the future of certain emerging technologies. In addition, he used the provided tools to monitor changes in the competitive environment, and wrote summaries based on the available information. The explicit knowledge was available to the knowledge seekers within his distributed R&D and product management organizations. In addition, the knowledge acquired and reported by different people within this organization was made available within the portal. In conclusion, he also acted as the knowledge steward for his unit. For example, content included market and customer analysis and product presentations, especially such product presentations that contained comparisons between own and competitive products. The technology manager learned to customize the tools and consequently he was capable of managing, maintaining and further developing his portal quite independently. In addition, he was quite actively in contact with the portal development team, providing his experiences and development ideas.

The portal was actively used during the first 2–3 years. However, after the technology manager left the case company, nobody was hired to replace him. The content creation for the portal decreased significantly – and therefore the active sharing of competitive environment information almost stopped. After four years of deployment, the portal still exists, with the content mostly created earlier, with the tools that show automati-

cally the latest information e.g. news, and with the tools that can be used to search for information, e.g. customer and competitor search tool.

The conclusion from this deployment highlights the importance of the sponsor and knowledge steward for sharing the knowledge. Without a person actively promoting and encouraging the knowledge sharing, it might not happen at all – even though the automatic content and search tools would be used by the knowledge seekers to acquire more information.

5.4.2 Example 2

BTP 2 use was started from the initiative of the corporate technology management during the technology review meeting preparations, and the idea was supported by the business unit technology managers. An expert from corporate research was selected by the technology management of the business unit to acquire the knowledge of the competitive environment by discussing and interviewing different experts from the business unit, from corporate research and from different associations.

The expert acquired the knowledge himself and constructed analyses and summaries of the selected key topics to the portal. Some recognized trends in the market, some emerging technologies and competitors and how they were acquiring intellectual properties for these technologies were selected as key issues. In addition, potential mergers and company acquisitions were analyzed from different perspectives. Key competitors and challengers were analyzed using SWOT analysis, based on the knowledge acquired from different sources, e.g. using the tools in the portal and analysis made by an external Internet research company. A patent profile was created with the patent officers for monitoring the patent situations within key and emerging technologies.

After a very active content creation phase, the portal was deployed with guidance from the BTP project team. Responsibilities for further content creation and maintaining the content were allocated to different people, and the use of different tools was learned. In addition, a portal sponsor and person responsible of promoting its use were selected; and the use of the portal started.

The expert from corporate research was very active in providing feedback and interacting with the project team to further specify the possible content, find new good quality information sources and create new improvement ideas for the tools related to the portal. In addition, the person promoting the portal and knowledge sharing within the business unit was active in contacts with the portal development team, and helped the team to understand the challenges in the portal, in the provided help texts and in the instructions. Based on her feedback, the Mail Tool was developed.

After 2 years since the start up of the portal, the business unit was sold. As the portal was developed based on the platform consisting of the used intranet technology and global server infrastructure, it was impossible to continue its use after the business unit left the case company. Consequently, the use of the portal needed to be stopped.

In conclusion, the business unit structures within a global corporation are subject to change and this causes risks when developing customized tools and processes, which need to be rebuilt after major structural changes. There are two alternatives in dealing with such risks:

- To choose such technology that is not dependent on company–specific structures, technologies and infrastructures, and hence enables the re–use of the tools even after units depart the corporation. However, building own platforms and structures that would be operational in a global context is time–consuming, expensive and difficult, and therefore such selections would limit the customization possibilities of the tools and their content.
- To choose the use of existing company specific structures, technologies and infrastructures, and hence enable building portals and tools that are fast to build and customize for different purposes.

As the team developing the Business Technology Portals selected the second option, it was able to concentrate more on developing the methods, and to customize processes and technologies the individual needs of the business unit with respect to their content, usability and functionality. Therefore, within the given budget, the team was able to collect more information on acquiring and sharing strategic knowledge, using such tools instead of purely establishing complicated information management systems and

database structures, etc. Based on cases described in the literature, many of the other implementations of knowledge systems have been able to progress only for establishing technical solutions for such information management systems.

5.4.3 Example 3

BTP 3 was started up by the business area technology management, and its use was started by choosing an expert from corporate research to fill it with content on technology and on competitors, to analyze strengths and weaknesses of different companies and their products. When deploying the portal for the business unit, the process and the responsibilities of collecting and sharing knowledge within a certain part of the content were discussed and agreed. Several training sessions were held for the employees on how to use the tools. Surprisingly, using and formulating simple search queries caused difficulties for knowledge workers.

Later on, the expert also used the portal and the associated tools when preparing material for the technology review meeting, with similar procedures as described for the BTP 2. The expert shared his knowledge regularly with the technology managers. The use of portal was started. However, soon after the deployment, it was recognized that the marketing manager had selected and purchased another business intelligence tool. Consequently, the content and use of the two portals needed to be combined into a one functional unit or system. This was done through the intranet interface, which provided an entry point for the two different systems. The search tools that had been customized for the business unit were kept and integrated to become a part of the intranet that was available for all the employees.

5.5 Experiences

The most difficult part of the implementation of the portals was the customization of the search engine, quite many unforeseen problems and limitations appeared. In the deployment, the most difficult part was collecting and analyzing the competitive environment information. It was not easy to convince the experts to write down summaries on the portal instead of power point slides. Especially difficult was to convince people

to write analysis continuously when strategic planning was not an on–going activity. As the lack of systematic scanning of the competitive environment is a major problem in organizations, it indicates that continuous strategy planning is not a reality in many organizations, despite its recognized importance.

In many cases, the technical features of the portal were the ones that got the attention of the managers, and convinced them to use the portal in their business unit. This is a paradox, since, after all, the most critical part of the deployment is not the technical features but rather understanding of the importance of continuous scanning and hence assuring the resources for this activity. In addition, it is critical to notice the need to use experts (knowledge stewards) to acquire and share strategic knowledge. On the other hand, since there is an obvious lack of this kind of resource in lean organizations, it is important to further develop the automatic filtering and scanning features of this kind of application to improve the efficiency of the scanning and the effect of the scanning. These issues should be developed, even though there is a recognized difficulty of implementing such features, and deciding which information is important.

Properly thought–through processes need to be defined and introduced with tools and methods supporting for enabling the successful, systematic and continuous monitoring of the competitive environment. Part of the process is to ensure that the organization recognizes the importance of the topic and provides resources that need to be committed. This would enable improving the scanning to be pushed bottom up, in parallel with the top management top down support. The principles of the process can be set up on corporate level, however the process and tools might need some customizations according to the needs and types of the businesses.

As indicated by the literature study, often scanning the competitive environment was done by marketing and sales people. In this study, even though the discussions were always started with technology managers, the deployment of the portal was mostly discussed with marketing or sales managers. This creates threats for proper environmental scanning, especially for strategic technology planning purposes, because this scanning is often too customer focused, neglecting other aspects of the competitive environment.

6 FOCUSED SUMMARY OF ARTICLES

The articles that are included as the second part of this dissertation are summarized here.

6.1 Knowledge Management Challenges: Information Management for Strategic Technology Planning

This article discusses the strategic technology planning, explaining that it consists of two parts, which are developing an integrated, coordinated and consistent long–term plan and facilitating the adaptation of the company to its environment. However, organizations are neglecting adjustment and scanning to the competitive environment.

Even though directing research and development investment is one of the biggest strategic decisions that organizations make, the technology considerations are often forgotten when creating the strategy. This can partly be because of a lack of managers who master both the business and technical aspects.

Besides lacking information on the competitive environment, there are other challenges as well. Managers today face an information overflow, consequently they have too much information available. Although this tremendous amount of available information exists, managers feel that they are missing the important information – the essential is drowned out by the unessential. Work is nowadays more global, and information is distributed to different individuals in different locations. Consequently we receive scattered information in small pieces. Since information is distributed to us without clues that relate it to a larger context and without knowledge of the information source, we are under threat of getting "tunnel vision", not being able to evaluate the reliability of the information.

Therefore, solutions need to be sought for setting our goals and values, developing tools, methods and an environment in which we can acquire, create, distribute and internalize knowledge. The goal is to provide information of good quality, which is

recent, relevant and reliable. Based on the theory, ideas on how to enhance information quality were proposed:

- Experts that are capable of understanding both business and technology aspects should participate in strategy planning, and especially for the required knowledge acquisition, to collect and share knowledge, e.g. using portals.
- Appropriate methods to translate experiences into common knowledge and to share this knowledge are needed.
- Appropriate methods and tools for constant scanning of the competitive environment are needed, e.g. tools, to find, prioritize and synthesize information.

The article describes a case study, where conclusions were tested. The used methodology was able to provide material that supported traditional business and technology planning, even though the methods are more opportunistic and innovative.

6.2 Expertise Cycle: Advanced Method for Sharing Expertise

The second article focuses on developing a framework and process of how expertise, a category of tacit knowledge, could be acquired and shared. It proposes that our personal observations and emotions, which are the basis of tacit knowledge, are difficult to describe and even more difficult to write on paper. The goal is not only to write down the knowledge, but in addition to compress distributed expertise and to make it accessible for other employees and managers. The article contains a framework called the Expertise Cycle for sharing expertise and it explains how expertise can be shared using other people, knowledge stewards.

Knowledge stewards interview experts to document their knowledge, behavior and parts of their reasoning and internal models. Trust and personal relationship with people interacting in the interview are the basis for good results for knowledge acquisition. Following from the interviews, knowledge construction begins. The knowledge stewards form their own internal models of the issue and document them, transferring them into explicit knowledge, written descriptions and instructions. A feedback loop with the experts assures the quality of the content. Other people learning about the

topic, knowledge seekers, can easily use the resulting text and their own experiments to create their own mental models about the issue. The phases are called a) knowledge acquisition, b) knowledge construction, c) information distribution and d) information interpretation.

While formulating the Expertise Cycle framework, the method was tested in two cases. In both of the cases, the expertise was distributed to different individuals and business units, who, despite requests did not compress and document it. Since the knowledge stewards faced different types of challenges daily, they formed communities of practice to share their experiences, to solve appearing problems by initiating systematic process and tool developments. Since in both cases the benefits of using knowledge stewards were bigger than the associated costs, the use of knowledge stewards was expanded. The article concludes that instead of providing more information, we should concentrate on providing better quality of information, by compressing and analyzing it. The Expertise Cycle is a valuable method to achieve this goal.

6.3 Internet Based Monitoring of the Competitive Environment

Article three explains that modern search engines can be used to build advanced tools that enhance competitive environment scanning and benchmarking on screening level. Internet based scanning is quite new field to practice - only few publications describe deployed constructions and case studies using such a process. However, scanning the competitive environment does not differ much from benchmarking practices on screening level.

Benchmarking on screening level was earlier presented and deployed as the best tool to measure the competitiveness. Benchmarking on screening level consists of benchmarking on-line, competitive benchmarking or partners benchmarking. Common idea in competitive benchmarking and in scanning the competitive environment is utilizing public data. The data is used to evaluate and to compare performance of different companies within the same competitive environment.

Existing literature on environmental scanning, competitive intelligence and benchmarking is reviewed to brief the theoretical background, and to find new ideas to

improve scanning of the competitive environment. Using theory-building approach, the research is based on constructive methodology.

This article presents news, company Internet pages and patent information as information sources that are available in the Internet and can be used to monitor the competitive environment. In addition, it presents methods and tools that can be used to automate and simplify the collecting of information on competitors.

News can be utilized by showing it to users daily, storing it, building search tools and by categorizing. In addition, weekly and monthly notifications can be implemented. Company Internet pages containing useful information can be utilized by building search tools, scanning changes or by automatic linking to financial reports. Patent information can be used either through Internet patent search tools or through a patent scanning application, which enables users to view only the patents that are relevant for their key technologies. In addition, different types of searches can be done from a wider information space, using selected keyword combinations, e.g. "competitor a" and "competitor b". Combination of the searches can be run every month, and then results are either sent to a person's e–mail or stored in a portal.

Based on the experiences of the described methods, their use is highly recommended. These methods will reduce the time spent on information collection, and time can be spent on analyzing and concluding information. However, the methods do not remove the need to spend time on scanning the competitive environment and planning a strategy – if there is no time available, even the most advanced information collection and analysis tools cannot help.

6.4 Information Quality for Strategic Technology Planning

Article four discusses the increasing importance of information to so–called information factories. As information management is their core competence, development of information quality should be the key focus when developing processes. Good quality information is error–free and fulfills the user's needs. Technology managers defined their needs as having recent, relevant and reliable information on the competitive environment. Reliable information is information that

is true. Since the truth of a piece of information is difficult to know or test, information coming from a trustworthy source is considered true information. Another characteristic is that information is consistent, meaning that it complements another piece of information, though information is delivered from several sources. Trustworthy sites are recognizable by the fact that the author's name is provided and modification date is given. Recent information means the same as timeliness of information, in other words information that is delivered as quickly as possible to the consumer and out–dated information is removed from the knowledge seekers' attention.

To provide good quality information, we need to find relevant information, choose the most essential parts and synthesize the collected information. Information technology can be used to help in this process:

- Advanced full text search engines can be used to find relevant information, based on key words or information categories
- Advanced search engines can be used to choose information that is reliable and actual, although this is more difficult.
- Analyzing and synthesizing information is a demanding task that might be impossible to implement, however summarization of information can help to accomplish this task.
- Search, agent and push technology can be combined to deliver services for the user.

The news, specific company or association Internet pages, customer complaint information and patent databases are the used information sources. Using an innovative approach, several methods used with full text search engines were tested in improving the different aspects of information quality. The selected methods were: reducing information space, increasing keyword use possibilities, improving the ranking of search results with iterations, structured searches with meta–information and using established information categorization.

Reducing information space is a useful method for improving the relevance and reliability of search results, especially if an expert has selected the information sources

out of wider set of preliminary search results. Increased keyword use possibilities and using established information categorization enhance the relevance of the search results. Structured searches with meta–information help to find relevant information and to evaluate the reliability of information. Improved ranking of search results with iterations helps to find more relevant information and push technology helps to present recent information, combined with personalization it helps to present relevant information for the knowledge seeker.

Based on these experiences, it is concluded that methods can improve the information quality for strategic technology management. Many methods are available especially for improving relevance of information. Improving the recentness and reliability of information is even more difficult.

The article has been written in cooperation with the E. Gelle, PhD., both of the authors contributing an equal amount to the writing.

6.5 Literature Research Approach on Research Topic: Scanning Competitive Environment

Based on the literature, descriptions of systematic continuous scanning are rare. In addition, no good summaries of the methods used for scanning the competitive environment exist. Article 5 describes the literature on scanning the competitive environment, and summarizes the methods and the tools that are used. The aim is

- To provide a comprehensive picture of existing scanning practices in order for organizations to compare their own practices with the existing state of the art
- To provide researchers a baseline of existing practices in order to compare their suggestions and their constructions
- To find innovative improvement ideas and new methods for improving scanning activities, which benefits practitioners and researchers in the further development of environmental scanning.

- While describing the concept of scanning the competitive environment, and methods and tools used for it, the article also describes how to carry out such a study with modern databases.

As result of this study, many conceptual descriptions of the topic were found, explaining why scanning the competitive environment is important, and categorizing scanning methods. Descriptions of specific methods were found, e.g. SWOT, QFD, expert essays and panels, Delphi, reverse engineering and literature reviews. In addition, some computer–based descriptions did exist, e.g. agents, push technology, filters. None of these methods fully combine humans and computers for systematic scanning process.

7 ANALYSIS AND CONCLUSIONS

This chapter discusses analysis and conclusions from the whole dissertation. In addition, each article includes analysis and conclusions for them separately.

7.1 Evaluation of the Construction

The objective of the dissertation is to develop a framework including appropriate methods and tools for acquiring and sharing strategic knowledge of the competitive environment, which will be used for strategic technology planning purposes. The recognized challenges in acquiring and sharing strategic knowledge of the competitive environment are described in the Table 1. The created construction is evaluated by considering these aspects and eliminating them or minimizing their affect. It is explained how these aspects were considered in the construction, and how successful was the elimination or minimization of their effect, which is evaluated based on the empirical research.

- Some available discussions on sharing tacit knowledge exist; however, sharing expertise is a topic on which there is not much knowledge. The author has developed a framework called the Expertise Cycle to describe how expertise can be shared, based on the available literature and case studies in this field.
- Organizations often neglect continuous and systematic scanning of the competitive environment. The developed framework, advanced tools and methods facilitate effective and less time-consuming scanning of the competitive environment. In addition, empirical research describes an example of how senior management can aim to increase the perceived importance of scanning the competitive environment. Therefore, the construction helps to decrease this challenge.
- The use of full text search methodologies and Internet, as the source of competitive environment information is not a well-known topic. The developed construction provides documented examples on tools that can be built by customizing fulltext search engines. The construction describes methods that can be used to increase the quality of the search results, and finding good quality information sources available in the Internet. In addition, the dissertation describes how tools, and more generally

search engines can be customized to utilize these information sources. In conclusion, the dissertation contributes to the existing knowledge base of full text search methodologies and the Internet.

- Scanning is performed only by few people, without adequate resources, and therefore the scope of the scanning has not been wide enough. Utilizing advanced methods and tools to scan the competitive environment facilitates the acquiring of information efficiently, thus saving time in the knowledge acquisition. Consequently, with the same amount of resources and time available, a wider area of the competitive environment can be scanned.
- Organizations neglect combining business and technology considerations when scanning the competitive environment. The construction emphasizes the need to choose such experts as knowledge stewards, who are able to understand the business and technology aspects. In addition, the Business Technology Portals contains within a single point of entry for information on business and technology aspects, Therefore, users are encouraged to consider business and technology aspects in the decision–making. Consequently, the construction helps to decrease this challenge.
- Instead of scanning the complete competitive environment, scanning has been focusing on customers, which has caused a lack of scanning other aspects of the competitive environment. The construction contains tools that are suitable for scanning competitors, suppliers, and technology information. Therefore, the construction helps to decrease this challenge.
- Managers suffer from info stress, receiving too much information. Instead of providing more information, this construction concentrates on providing less, but good quality of information for managers. Providing less but better quality of information is done by experts, knowledge stewards who acquire strategic knowledge of the competitive environment, further analyzing, synthesizing, filtering and summarizing it before sharing the knowledge with managers. Therefore, the construction helps to decrease this challenge.
- Information is transferred in pieces that are often incoherent and in conflict with some other pieces. After the experts have acquired knowledge of the competitive environment, they analyze, filter, synthesize and summarize the knowledge, conse-

quently the shared knowledge and the information is not incoherent and conflicting with other pieces. Therefore, the construction helps to decrease this challenge.

- New information from recent scanning is not integrated into existing information of the organization. The Business Technology Portals are used to store the documented results from previous scanning, and to combine them in the same environment where knowledge acquisition is done using the advanced tools. The knowledge stewards combine documented information in the portal, their existing expertise, expertise of the other experts who are interviewed, and the new information they find by scanning the competitive environment. However, the construction is not able to solve the challenge as a whole. Combining the information stored in different information management systems within the company was the aim due to the different purposes of the information in different systems. Therefore, this issue partly remains unsolved.
- The strengths of computers and humans have not been utilized by integrating them successfully into the same systematic scanning process. The efficiency of computers in acquiring and processing the information is combined with human strengths in acquiring, sharing and constructing knowledge (interviewing other experts, using the advanced computer based tools, filtering, analyzing, synthesizing and summarizing the resulting knowledge). Therefore, the construction helps to decrease this challenge.
- Managers do not typically use various sources of information, e.g. online information, but rather acquire knowledge through their informal networks. The construction addresses this problem in three ways. First, the experts acting as knowledge stewards are the main users of the on–line information, building the required expertise on the topic and summarizing their views, and sharing the views with top management. Secondly, the experts provide links to the on–line information sources, hence indicating the availability and the usefulness of the information in the electronic information sources. Thirdly, the experts document their own views on–line, where it can be used by other people seeking information on the same topic, and therefore the use of other used electronic information sources is promoted to this wider group of knowledge seekers. Thus a solution has been found to the recognized gap in advanced tools that can be used for scanning, and to

the resistance of managers to use such tools themselves. Therefore, the construction helps to decrease this challenge.

Some other benefits of the construction are

- Including a wider group of people for scanning, which will ease implementing the strategy
- Highlighting the importance of information quality
- Providing a framework for transferring individual knowledge into organizational knowledge
- Recognizing the importance of trust, care and personal networks in acquiring and sharing strategic knowledge.

A remaining challenge, and a negative characteristic of the developed construction is that it is not able to guarantee that enough resources and time is available for scanning the competitive environment continuously. Eliminating this challenge would require that scanning is given enough priority within organizations and the importance of scanning the competitive environment is fully understood. This factor has been decreased by the effort and support given by group technology management for highlighting the importance of this topic, with the messages communicated and with the examples shown by allocating attention and time to the topic.

Another drawback of the selected platform technology was that it had a difficult user interface for entering the information. These difficulties were recognized beforehand and reduced by well–written and visualized instructions, personal training and support given by the BTP project team members and developing of the Mail Tool.

The construction assumes that experts who could be used to scan the competitor environment are available within the company. If external consultants are used in a similar set–up, the biggest challenge is the trust between the managers, interviewed experts, and the knowledge steward. As the importance of trusted relationships between these participants has been recognized and highlighted, in practice this feature limits the possibility of using external experts.

As a global corporation, the case company had the possibility to invest in funding such a project developing framework, appropriate methods and tools for acquiring and sharing knowledge. The project required deep knowledge and competence on how to set up and customize advanced full–text search engines, which required a significant amount of time for experimenting and learning. Deploying such tools with in–house resources is impossible in small organizations. However, setting up the system and customizing the tools can be done by external consultants since the customization work itself does not require deep knowledge of the business, and the competitive environment, and consequently no critical information needs to be shared with external consultants. In any case, the framework of how to acquire and share strategic knowledge of the competitive environment could be used in small and medium size organizations, even without similar tools. The benefits of sharing information that has been purchased are bigger in large global organizations, due to the larger amount of employees. Providing the purchased information efficiently for all the knowledge seekers is easier in small organizations located in one site only, without the need for such portals.

The developed framework, methods and similar tools could be applied in organizations that are willing to improve the acquiring and sharing of strategic knowledge of the competitive environment for creating technology strategy. The framework, tools and methods could be applicable as a whole or as parts to the acquiring and sharing of other kinds of strategic knowledge as well. However, testing and verifying this aspect has been clearly excluded from the dissertation. Evaluating the applicability and suitability would be a good topic for a separate new study. Construction was used for strategic technology planning, however with small modifications, it could be useful for creating other parts of the organizations strategy.

The construction is appropriate for its purpose of improving the acquiring and sharing of strategic knowledge of the competitive environment for strategic technology planning, because it has been successfully used for strategic technology planning in 10 business units of the case company, and its use has been extended for other business units as well. In addition, the construction could be better than several available

methods and tools, as it has been successful in eliminating or decreasing the effects of the challenges that were recognized as typical for other methods and tools.

The construction is new and innovative, because it combines advanced results in several research fields, e.g. in knowledge management, environmental scanning and competitive intelligence. The construction could be considered unique because it combines advanced methods and tools in a new way. The construction is important because it is capable of solving challenges in one of the most important but undeveloped processes, which affect significantly the success of the company. The achievements have been possible due to the unique feature of the BTP project team consisting of experts in the different fields.

7.2 Fulfilling the Targets of the Dissertation

The objective of the dissertation is to develop a framework including appropriate methods and tools for acquiring and sharing strategic knowledge for strategic technology planning. The studies presented in the different articles can be seen as separate, individual studies under the same main title of acquiring and sharing strategic knowledge of the competitive environment, and with the same objective. The studies are created to complement each other – they describe and investigate the acquiring and sharing strategic knowledge of the competitive environment from different perspectives. As discussed in Chapter 2, in order to reach the objective of the dissertation, several other targets have to be reached. Their fulfillment is discussed next.

Challenges and generic development ideas in the field of acquiring and sharing strategic knowledge of the competitive environment for strategic technology planning should be understood and described. The challenges are described based on experiences in organizations, discussions with technology management, and viewing the existing literature from different perspectives. While scanning the literature, and during unstructured and structured literature searches, the development ideas were recorded and documented.

The reported results concerning the challenges and their commonness can be utilized, for instance, as a starting point in other studies. The result provides insights and an understanding of why organizations typically are not successful in acquiring and sharing a strategic knowledge base of the competitive environment. Consequently, the knowledge of challenges and generic development ideas is increased and this target has been met.

Currently used methods and tools are evaluated based on the available literature, in order to make conclusions on the best approach for the construction. Further on, methods and tools are evaluated to compare the proposed construction with methods currently used by organizations. The findings summarize, synthesize and evaluate the methods and tools currently used in organizations. Therefore, the dissertation provides a comprehensive picture of existing scanning practices, which can be used in organizations to compare their own practices and their own ideas with the existing state of the art.

The proposed framework, methods and tools are described, implemented and tested using case study methodology to describe and evaluate experience of their use.The framework, and included methods and tools, have been implemented in different business units of the case company. As use of the construction has been tested (weak market test) and its use extended, the framework and included methods and tools are considered appropriate. They are also considered appropriate and relevant, since they have been able to minimize or reduce the challenges of existing practices. These challenges were listed in Table 1 and the influence of existing practices to the listed challenges have been described in section 3.5 Existing Methods and Tools for Acquiring and Sharing Strategic Knowledge of the Competitive Environment and in Table 8. According to experience, the framework, tools and methods can offer important benefits for their users. Simplicity and the ease of use have been evaluated with first users, and improved continuously. Simplicity and ease of use are important criteria for evaluating the validity of applied research in general.

According to the evaluation, the framework, the tools and the methods are useful and appropriate. In addition, the principles are simple enough to be of real practical value to their users and to benefit effective scanning. Therefore, this target has been met.

The framework for acquiring and sharing strategic knowledge, where the developed methods and tools are included as essential parts, is described. This dissertation presents a developed framework, called the Strategic Knowledge Cycle, which is used to acquire and share strategic knowledge of the competitive environment (4.3 Strategic Knowledge Cycle, Framework for Sharing Strategic Knowledge). The framework includes methods and tools, which are also described in the dissertation. Based on experience, some practical advice is provided to enable and support the successful and efficient use of the tools and methods. In conclusion, this target has been met.

This dissertation is based on case studies, and aims to build theory, more so than testing theory. There are many potential sources of bias and invalid qualitative interpretations in such a selected approach. To evaluate validity, data including different methods, different hierarchical levels and from different case studies was used.

As discussed above, this construction can be considered new and innovative, and therefore it increases the cumulative knowledge base on theory of scanning the competitive environment.

The dissertation did not aim to express an unambiguous truth and fact, but rather to show the complexity of the studied phenomena, and to provide means to decrease the associated challenges and therefore the aim has been fulfilled.

7.3 Evaluation of the Research

The first feature of the selected research approach is using constructive research. According to Kasanen et al. (1991), the characteristics of a constructive research approach are:

- Progressing stepwise so that the features of each step are defined in the background system, into which the construction is applied.
- It must be possible to verify each step.
- The goal to which taking the steps aims. If the goal is fulfilled, the construction is usable.

A construction is solving a concrete problem within a scientific frame. A construction study consists of developing a construction and testing it in the practice. In addition, when the goal has been achieved, the construction is shown to be useful and applicable, which is the prerequisite for the construction (Olkkonen 1993). A weak market test is most often used for testing. The key question in a weak market test is: "Has a business responsible manager been willing to apply the construction in his or her actual decision making?" Other market test types are semi–strong market tests and strong market tests. (Kasanen et al. 1991) The goal of a construction study is to establish a new solution for the problem, which is applicable for the whole problem type. The result is tested according to the principles of the research: the construction must increase the common knowledge base of solving this type of problem. (Olkkonen 1993) The characteristics of applied science are: the results must be relevant, simple and easy to use.

In conclusion, the main characteristics of constructive research are:

a) it produces an innovative and theoretically warranted solution to a relevant real–world problem

b) the solution is shown to work in practice

c) the solution is shown to be at least potentially adequate more generally as well. (Kasanen et al. 1991).

Concerning the criteria for successful constructive research presented above, the construction has been developed stepwise, enabling the background system to influence the steps, and the steps have been described in the articles and in Chapter 2, 4 and 5, and therefore they can be verified. The construction has also fulfilled its goal and targets, as described in the previous pages. The construction has produced a new

innovative framework, and methods and tools to support it, i.e. new solution to the problem. The problem (the challenges) has been discussed in several publications, therefore the problem is relevant. The solution has been developed and closely linked to theory as discussed in the earlier chapters of this thesis.

The construction as a whole and all its parts have passed the weak market test, since the construction has been implemented in several business units. The construction for the acquiring and sharing strategic knowledge of the competitive environment was studied in many business units, and the findings were replicated, therefore the construction is likely to succeed in other units as well.

All the business units belong to the same global corporation, therefore this fact might affect the reliability of the study. The impact is only minimal because the methods have been tested in numerous business units, each of them being different in size, from their organizational structures and from the competitive environment in which they operate. In addition, the business units were located in different countries: Switzerland, Germany, Italy, Finland and the USA. As the business units differ from each other, they provide a good understanding of the suitability of the construction for different kinds of environments. However, the results cannot be directly generalized to apply to all or to average organizations, because the business units were not selected randomly, nor to represent some preliminary defined company types. Generalizations should be avoided also due to the relatively small number of studied organizations.

The solution has been tested in practice using a weak market test (10 business units) and it has been shown to work in practice, i.e. useful and applicable. The solution has been shown to be potentially adequate more generally as well, by linking it to the theoretical background, and through this showing that the results could apply elsewhere. As the criteria presented by Kasanen et al. and Olkkonen for successful constructive research approach have been fulfilled, the developed research is concluded to be successfully completed, providing the expected contribution.

As conclusion, this dissertation has created new, innovative, unique, and relevant understanding and knowledge for both academic and industrial purposes. However, it

must be noted that the real value of the contribution can be evidenced only after some years have passed.

The theoretical contributions of the dissertation are threefold. The dissertation provides a contribution to the present body of knowledge by facilitating comprehensiveness and versatility in understanding acquiring and sharing of strategic knowledge of the competitive environment for strategic technology planning. In the practice, it increases awareness of acquiring and sharing strategic knowledge of the competitive environment. It describes the existing challenges and importance of people committing their time and effort to promote the tools and methods. To be aware of these issues and start discussion about the subject is the initial essential step for improving acquiring and sharing strategic knowledge of the competitive environment in different organizations.

Secondly, the dissertation summarizes the methods and tools currently used in organizations; and the innovative methods that are proposed by recent scientific literature. Thirdly, the construction including framework, tools and methods are of value as an example for other practitioners seeking to improve their own practices. It helps to understand how the scanning activities can be improved. The contribution includes more in–depth experience of their use, which enables the creation and implementation of similar approaches in other organizations. The dissertation provides descriptions of the framework, methods, tools and the results achieved.

7.4 Future Research

It has been shown that the possibilities of improving the acquiring and sharing of strategic knowledge exist. By investigating the challenges of current practices, a new approach containing appropriate methods and tools was found. The greatest possibilities seem to be in combining computers and humans into the same scanning process, utilizing the strengths of computers in systematic environmental scanning and human intelligence in deciding which changes, trends and signals are significant. Computers can be used to further on to find more information sources and signals that are similar to ones that were picked out by humans. In addition, human capabilities are needed in analyzing and synthesizing the information to become knowledge and to share the cre-

ated tacit knowledge with decision makers. Even though good methods to combine the strengths of humans and computers in improving the systematic scanning process were found, other tools and methods could be built and used as well. Finding, investigating and deploying such tools and methods would be a good topic for future research.

In addition, it was recognized that the success of such advanced methods and tools in organizations depends very much on the availability of people who would have time to scan the competitive environment continuously and who would promote the use of such tools within their organizations. Therefore, it is proposed that more research should be carried out on how the importance of environmental scanning could be raised in organizations. In addition, it should be investigated how the organizations would be able to establish a culture where time can be used for scanning the competitive environment. One possible approach is using rewards: as rewards reflect organizational values and targets, could they enhance the importance associated with continuous scanning and contribute time for it?

The factors that emerged in this study are not necessarily the only or even the most relevant dimensions of environmental scanning, even though there is strong support from the literature. Consequently, the topic should be further studied, and the proposed framework, methods and tools should be further tested. As discussed before, the generalization of the results for different organizations remains a topic for future research. In addition, the framework, and most of the methods could be applicable for sharing other kind of strategic knowledge as well.

The dissertation has focused on strategic technology planning, however the framework and most of the methods and tools could be suitable for other parts of strategic planning as well. Therefore, the applicability of the construction for acquiring and sharing strategic knowledge for other parts of strategic planning should be further investigated.

A very appealing research topic for future research would be investigating and measuring how much use of the Internet as the source of competitive information, using modern advanced full-text search engines and using experts as knowledge stewards are able to improve the strategic planning or success of the company. In addition, it would be interesting to note which method has the highest impact on improved

success. A lack of managers who have the required knowledge of both technical and business aspects, should be recognized properly in the literature. Multiple case studies comparing the success of managers, who master both the technical and business aspects and the success of managers, who do not master both of them, could be an interesting topic for future research.

Roussel et al. (2001) has stated that R&D produces one product only, which is knowledge, knowledge with a purpose. The produced knowledge must be transferred by management actions into products, cost reductions, quality improvements etc. He also claims that new product development is probably the most complex process within organizations since it includes multiple transfers of knowledge within the company and with external partners, e.g. manufacturing, engineering, marketing, sales and customers. Even though the R&D is so challenging from knowledge management perspective, surprisingly few other researchers have emphasized this fact, and investigated or developed R&D from the knowledge management perspective. Use of knowledge management theory could be beneficial in enhancing other parts of new product development as well.

Another trend in R&D has been the growth of virtual teams and virtual project teams, which creates additional challenges for managing the knowledge in R&D. Virtual teams typically lack frequent face to face meetings and instead use a range of communication technologies. Virtual teams are distant over space and time, they cross organizational boundaries, and they have diverse team members and vague membership definitions (Junemann & Lloyd 2003). The influence of virtual teams on knowledge sharing in R&D would be a beneficial topic for future research.

The questions and ideas presented here were not included in the scope of this dissertation due to the limited time and limited budget for the study, but also due to the intent of studying within a smaller scope but then providing more experiences and a deeper understanding within that scope.

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APPENDIX

System and method for searching information automatically according to analysed results

EP1363203
2003–11–19
KARHU KATJA (CH)
Case company RESEARCH LTD (CH)

Abstract

The present invention is a system and method for automatically providing users with good quality information from plurality of information sources. The information supplied to the user through push technology from first information source is filtered to extract relevant information. This information is then categorized and stored in host database. Further analysis is done on the categorized information to identify further search criteria. Based on further search criteria new search is carried out in another information source to obtain related information. Results of further search along with the stored information are presented to the user in user–friendly format.

Process and system for presenting help information in a data processing system

EP1343077
2003–09–10
KARHU KATJA (CH); LE JULIEN (CH); GELLE ESTHER (CH); RIFFEL MICHAEL (DE); SCHEPIK VIKTOR (DE)
Case company RESEARCH LTD (CH)

Abstract

The invention is directed to a process for a context and user role sensitive presentation of help information in a data processing system, said help information invoked by a user, comprising the following steps: Determining a present context in which the data processing system is at the time point of help invocation; Determining, in which user role the user is registered with the data processing system; Retrieving suitable help information in a help database,

depending on the determined present context and the determined user role; and Presenting said suitable help information to the user. The invention is also directed to a system for such a help functionality.

Process and system for generating and improving a collection of information objects

EP1324220
2003–07–02
KARHU KATJA (CH); LE JULIEN (CH); GELLE ESTHER (CH); RIFFEL MICHAEL (DE); SCHEPIK VIKTOR (DE)
Case company RESEARCH LTD (CH)

Abstract

The invention is directed to a process for automatically generating and/or improving a data collection of information objects, comprising the following steps: retrieving at least one information object from a data pool of information objects; determining the relevance of at least one of the retrieved information objects to at least one user; and storing those information objects in a data collection having a relevance greater than a preset threshold. The invention is further directed to a data collecting system for automatically generating and/or improving a data collection of information objects, comprising an information object retrieving means for retrieving information objects from a data pool of information objects; a relevance determination means for determining the relevance of at least one of the retrieved information objects to at least one user and for determining if the relevance of an information object is higher than a preset threshold; a data collection for storing information objects having a relevance higher than the threshold.

Method of searching based on categories for information objects in information pools and system to find such information objects

EP1324219
2003–07–02
KARHU KATJA (CH); LE JULIEN (CH); GELLE ESTHER (CH); RIFFEL MICHAEL (DE); SCHEPIK VIKTOR (DE)
Case company RESEARCH LTD (CH)

Abstract

Method has the following steps: searching of an information pool for information matching user defined search criteria; fixing of at least one category of a categorization system for at least a part of the information pool to which the information objects are assigned and–or assignment of located objects to categories, if the information is to be filtered with category categories; and filtering and presentation of the obtained data according to user defined category and similarity criteria.

System for categorising data objects and method of checking the consistency of the designation of categories to the data objects

EP1324218
2003–07–02
KARHU KATJA (CH); LE JULIEN (CH); GELLE ESTHER (CH); RIFFEL MICHAEL (DE); SCHEPIK VIKTOR (DE)
Case company RESEARCH LTD (CH)

Abstract

The invention relates to a categorizing system comprising: an interaction means (1) for inputting assignments of data objects to categories; a database (2) that stores at least one consistency condition rule for determining consequences concerning assignments of data objects to categories resulting from a user–input assignment of a data object to a category, and; a consistency verifying means (3) for verifying the consistency of input assignments using the at least one consistency condition rule in the database (2).

Knowledge Management Challenges: Information Management for Technology Strategy Planning

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Abstract:

Screening the competitive environment and combining business and technology aspects are typical problems in the strategy planning systems. In addition, managers receive too much information but are left without information that is analyzed and synthesized. Therefore, they are under threat of making non-optimal strategy decisions. Better processes and tools to screen the competitive environment, to combine business and technology considerations and to produce synthesized information, should be developed. Furthermore, the synthesized information needs to be easily accessible to the concerned people, e.g. through portals.

These ideas are implemented in ABB, by new process of business technology evaluations, which produces analyzed and synthesized information on technology and on competitive environment. In addition, business technology portals and other advanced tools are built to collect, to structure and to share the knowledge on these issues. The methods are proven to be successful, and therefore their usage is being expanded within ABB.

This article explains the challenges that typically appear in strategy planning systems, where two major shortcomings are recognized. First, companies often neglect screening of competitive environment, as well as combining the technical and economical considerations. Second, managers are today facing information overflow, consequently they have too much information available, but on the other hand, they lack recent, relevant and reliable information. Due to defective strategic planning systems and "infostress", managers are at a risk of non-optimal business decisions.

To solve the problem, we need to recognize our goal to protect our minds and prevent unnecessary irritants, enabling that essential information can be well managed. As organizations, we need to find

better ways to find, prioritize and synthesize information. We need to find methods to translate experiences to common knowledge and to transfer the common knowledge within the companies. In addition, to systematically and constantly screen the competitive environment, we need to extend the strategy planning to consider, besides the senior management, at least experts and other people that are capable of understanding both business and technology aspects. We should also develop tools that enhance screening of competitive environment.

Presented case from ABB describes an example where the availability of too much information on the competitive environment and, on the other hand, the lack of recent, relevant and reliable information is causing information stress. Target of the development is to form a better process and tools to constantly and systematically acquire, analyze and compress the information on the competitive environment, and to combine the business and technology considerations. The literature used to build the framework of the study is Strategic Planning and Knowledge Management. The research method in the case study is partly descriptive and partly constructive, the author was developing tools that are described in the case.

1. Competitive Environment in Strategic Planning

Strategy is a unifying idea that links the functional areas and activities of the company to its competitive environment; this definition was originally presented by K. R. Andrews. The fit between the critical competencies of the company and its environment defines its success [Montgomery et al 1991]. To succeed companies need to concentrate on developing their core competencies [Prahaland et al 1990]. Strategic planning system is a structured process that organizes and coordinates the activities of the managers, who plan the strategy. It has two major functions

- developing an integrated, coordinated and consistent long-term plan of action
- facilitating the adaptation of the corporation to environmental change [Lorange et al 1976]

However, it is quite common that companies concentrate on the integrative aspects of the strategy planning, forgetting to screen their competitive environment that it needs to adjust [Lorange et al 1976, Montgomery et al 1991]. However, besides the competitors, the competitive environment also consists of the underlying economics and so called competitive forces, which need to be screened as well. These classical competitive forces are

- Threat of new entrants
- Bargaining power of suppliers
- Bargaining power of customers
- Threat of substitute products [Porter 1979]

Due to the globalization and fast changing markets, best companies have realized that the success demands the best market information and the ability to react on it quickly. Therefore, competitive environment needs to be screened constantly. This is only possible if the strategic planning and information acquisition it requires is expanded to concern the whole company, or at least a large number of its experts [Gendron 1998, Prewitt 1998]. Mintzberg emphasizes that strategic planning and implementation should not be separated, only implementation reveals the success of the strategy [Mintzberg 1994]. To enable a successful implementation of the strategy, people need to participate in planning [Gendron 1998].

One of the essential strategic decisions for companies who manufacture or design products is directing research and development investments, because of the significant time and money

commitments that are made. However, the prospect of the technology considerations is often-neglected issue in the strategy planning system. The reason is that managers who master both technical and business aspects are rare, however, managers and companies need to manage and pay attention to technical and economical considerations simultaneously [Kantrow 1980]. The lack of managers who master both technical and business aspects is another important factor to include more people to plan the strategy.

To master the technology strategy, an organization needs to recognize its key technologies, master them and further more use them properly to beat the competition. In order to find out its technical competitive position, an organization needs to screen its environment constantly. Mostly screening is done based on good technology judgments and insights [Roussel et al 1991]. On the other hand, experts cannot usually predict the future better than other people, even though they often believe they can [Starbuck 1992]. However, it is evident that technical experts need to participate in the technology strategy planning.

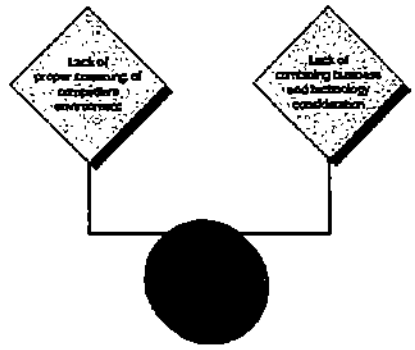

Figure 1. The strategy planning systems are often incomplete.

As conclusion, in the strategy planning systems, screening competitive environment is often neglected, as well as combining technical and economical considerations, and evaluating the strengths of competitors in the key technologies. This means that strategy planning systems are often incomplete and ineffective, see Figure 1.

2. Symptoms of Information Flood

The availability of too much information as well as fast changing markets and technology are causing us information flood, a phenomenon which has several names, e.g. infosmog [Applehans et al 1999]. As consequence, we are receiving too much information, which is coming from distributed sources, It is often scattered and unreliable since it is coming from unknown sources. These symptoms are described here in details.

There is too much information available - every day people feel frustrated trying to handle all the information they receive. Since this is a generally acknowledged problem, examples are not hard to find: all the messages we find daily in our mail boxes, the daily appearance of 20 million new web pages or the amount of information in other media. In 1472 the best library of the world, Queens College in Cambridge, contained 199 books when today 300 000 new books are published every year [Davenport et al 2001].

Although this tremendous amount of information we have, people still feel that they are missing important information. Essential information is often drowning among unessential, similar

information is repeated and the information is renewing its form but not always the content. Over-supply of information leads to decreasing value of information, to stress and saturation [Marie 1999]. Because of the information flood, the knowledge workers are in threat to weakening quality of thinking. Running after the latest information consumes their energy and prevents their concentration on long-span work.

Information is also becoming more global than ever - following the development of markets and technology near us is not good enough. We need to pay attention to the whole world. Since we want to include the whole global company to include screening the competitive environment, the information will be distributed to different individuals and different locations. Since we receive information from distributed sources, it is often scattered. According to Brown and Duguid [2000] knowledge workers are also in threat of getting a tunnel vision, because the information is often transferred in small pieces. Information pieces are lacking enough clues and glues, which set the information into larger context. Nevertheless, this is exactly what our brains need, they work by comparing and attaching the new information in to the existing information. Therefore, information is lacking its social context. People evaluate the reliability of the information by relating it to the reliability and other characters of the person who is the source of the information. If the information we receive is lacking the social context, e.g. we do not know the source personally, it is difficult to trust on the information. [Brown et al 2000, Davenport et al]

The speed in which technology and science is constantly developing is increasing exponentially, producing increased amount of information every day, e.g. 90 percentage of researches that have ever existed are living now [Nordström et al 1999]. The markets and technologies change fast, and the information that is relevant and recent today becomes obsolete fast.

Davenport and Beck present the symptoms on the organizational level as increased likelihood of missing key information when making decisions, diminished time for reflection of anything else than simple transactions, difficulty in holding others attention and decreased ability to focus when ever necessary. [Davenport et al 2001]. Therefore, we can conclude that organizations suffer from the infostress as well as individuals.

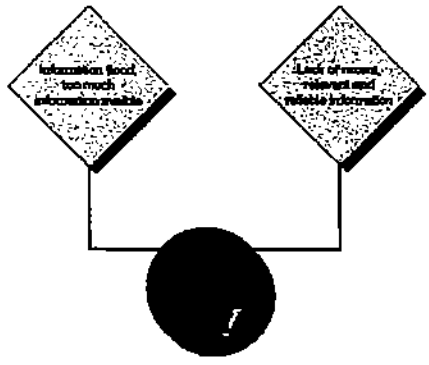

Figure 2. Information stress

As a conclusion, in the new economy, global companies face the challenges of global markets and fast changing technology. Information resides in different parts of the company, distributed to different individuals and is often transferred to us in pieces that are often incoherent and in confrontation with some other pieces. Having too much information available is a typical symptom of the information flood. However, the information that is available is not of good quality, it might

not be recent, relevant or reliable. These issues lead individuals and organizations to suffer from "infostress", see Figure 2.

This article has discussed the challenges of the incomplete strategy planning systems and the "infostress", that managers suffer from today. These two characters of the strategic information lead us to situation where we are at risk to non-optimal decision making. See Figure 3.

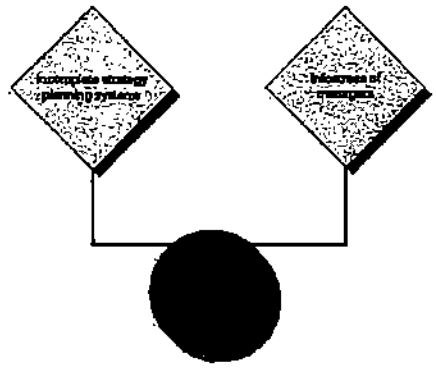

Figure 3. Non-optimal strategic decisions.

However, now we need to ask what can be done to improve the situation. The solutions need to be looked from:

- Setting our goals and values
- Understanding and developing the knowledge processes and environment, in which we acquire, create, distribute and internalize knowledge
- Developing tools that help us.

3. Enhancing Strategy Planning Systems

Previously it was described that strategic planning systems lack the proper screening of the competitive environment and combining the business and technology aspects. Therefore, it is reasonable that improving these functions are the goals of development.

3.1. Developing the Strategy Planning Process

Strategy planning process needs to include screening the competitive environment, and it needs to consider how this should be done efficiently. Several proposals for this have been already presented

- Strategy planning needs to be extended to consider, besides the senior management, technical experts of the company.
- People that are capable of understanding both business and technology aspects need to be included to the strategy planning.
- Competitive environment needs to be screened systematically and constantly

Therefore, a new process that fulfills the criteria, needs to be planned and implemented. Nevertheless, in the current literature, there is no sufficient understanding what kind of process could fulfill the purpose.

As discussed earlier, information on the competitive environment is the essence of the strategy formulation, therefore developing it is of strategic importance. Hence, we need to look for solution from the literature, which handles knowledge management in strategic issues. Strategic Transfer, a method to manage knowledge in strategic issues by Dixon [2000], is described here.

Strategic transfer involves transferring very complex knowledge, such as how to launch a product or make an acquisition, from one team to another in cases where the teams may be separated by both time and space. Strategic transfer is used when the needed knowledge exists somewhere in the organization, although widely dispersed.

Often people are being able to find out only knowledge they are aware they need. Strategic transfer on the other hand is forward looking and needs to ask, "What knowledge do we need?". Strategic transfer is focused on the end user or the recipient of the knowledge rather than the source. what the end user will need is not easy, since what the users most need is often the information they are most unaware. Opportunities for collecting the needed knowledge that resides in the company need to be identified. The topics are those that often have long lasting and wide impact; therefore, the ability to collect the organization's knowledge on such issues has long been sought-after target that only recently seems possible.

People having the strategic experience should not be responsible for making it usable for others. Non-team members, knowledge specialists, should be used to formulate questions that elicit the reasoning of each person being interviewed. Good knowledge specialists are people who are well experienced in the subject matter and then trained to data collection. Who is considered a viable source of knowledge on a topic and which topics are addressed impacts the result remarkably; multiple voices are to be synthesized. [Dixon 2000]

From the strategic transfer the following solutions were collected:

- Usage of external people to transfer the knowledge
- Starting with questioning the information needs
- Finding out which information already exists in the company

3.2. Developing Information and the Communication Technologies

Besides developing the process of screening the competitive environment, we should develop tools that enhance screening of competitive environment. Software tools for this purpose are often categorized as competitive intelligence tools. Though these tools exist, they are incomplete, since their development and deployment are still in the first phases. The difficulty of developing such tools comes from the fundamentals of building intelligent software. Until now, we have not seen applications that could be even nearly as effective as people in analyzing and synthesizing the knowledge.

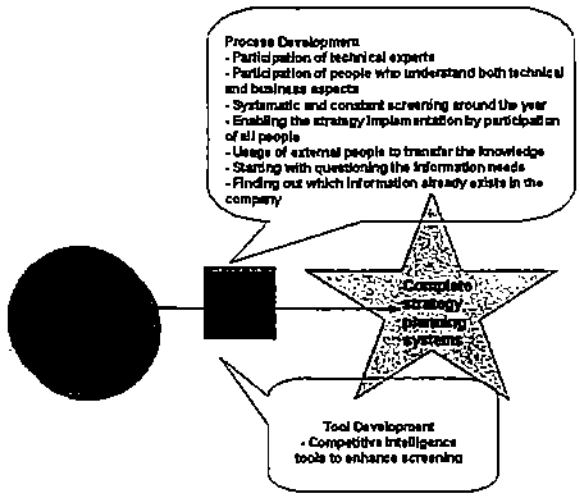

Figure 4. The methods to reach the target of complete strategy planning systems.

As conclusion, to reach the target of complete strategy planning systems, we should develop the knowledge processes and tools. The proposed methods are presented in the Figure 4.

4. Enhancing Information Acquisition

The amount of distributed information is not likely to decrease by itself, which is the reason why we should pay attention to balancing demand and supply of information. Providing wrong information or too much information leads into frustrations and a waste of time. It would be better, if we could provide less information with a better quality. Reaching this balance of getting enough information but still avoiding the unnecessary information is one the most important means to avoid infostress.

4.1. Setting our Goals and Values

Setting our goals and values should start with realizing that there are plenty of people who try to maximize receiving, transmitting and modifying information [Forester 1992]. However, is this really what we want? Without stress, our brain constantly focuses on information that we are interested. However, since our brains are capable of handling only certain amount of information, we need to prioritize our information needs to focus the attention to the things that really matters. Therefore the goal of process and software development is to focus our attention to things that really matter, we can then look for help from the process and software development. Hence, instead of getting more information we should concentrate on getting better quality of information. Quality of information should be measured by how well the information fits to our needs.

4.2. Developing Knowledge Processes and Environment

We have seen that it is no longer good enough to give employees powerful software tools, e.g., intranets and e-mail, instead we need to find the principles of the new environment that help us to survive the infostress [Applehans et al 1999]. For individuals, most important skills to manage the information flood are:

- Ability to find relevant information which fulfills our needs
- Ability to choose the most essential part of the information
- Ability to analyze and to synthesize collected information [Kerr 1996]

The importance of synthesizing information is explained by Brown and Duguid [2000] who point out that people do not have stress because they have too many atoms available, since they manage the atoms as bigger entities, e.g., cars or flowers. Similarly, we should avoid "infostress" by managing the information pieces as bigger entities, e.g., as analyzed reports and summaries.

This article presents the challenge and especially the solutions for organizations, not for individuals. However, the skills to find, prioritize and synthesize available information are also required to manage the infostress in organizations. An important part of the information, that is to be collected, is tacit knowledge, which is difficult to explain and share. [Nonaka et al 1994] Sharing tacit knowledge creates additional challenges for organizations who must continually reinvent and update their common knowledge.

They have to

- Find effective ways to translate experiences into knowledge and create commonknowledge
- Transfer that knowledge across time and space, to leverage common knowledge [Dixon 2000]

When firms craft their strategy they really ask to what questions they allocate management attention, all aspects of the competitive environment cannot be scanned or analyzed [Davenport et al 2001].

4.3. Developing Information and the Communication Technologies

Businesses are envisioning new ways to pursue information technologies to find, prioritize, synthesize and share information. We should seek methods to filter, classify and select information to find essential information as easily as possible, without wasting human resources. We should also invent tools that help people to synthesize and share information.

Knowledge portals can help in screening the environment providing single point of access to all relevant information. They assist the people who acquire, analyze and synthesize the knowledge by providing them a knowledge structure and access to relevant tools and Internet sites. Knowledge portals also help to transfer the collected and synthesized knowledge within different locations of global companies.

As conclusion, to reach the target of handling optimal amount of good quality information, we should develop the knowledge processes and tools. The proposed methods are presented in Figure 5.

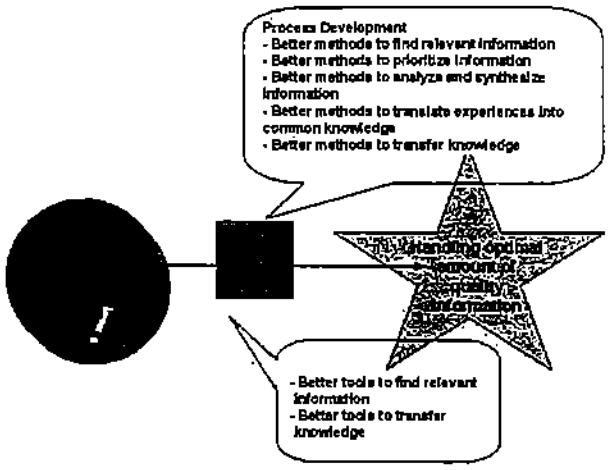

Figure 5. The methods for handling optimal amount of quality information.

5. Methods for Improving Quality of Strategic Decisions

As discussed, to reach optimal strategic decisions, we need to be able to manage optimal amount of good quality information and to create complete strategy planning systems. See Figure 6. These separate targets can be reached by developing the knowledge environment and processes and by developing better tools.

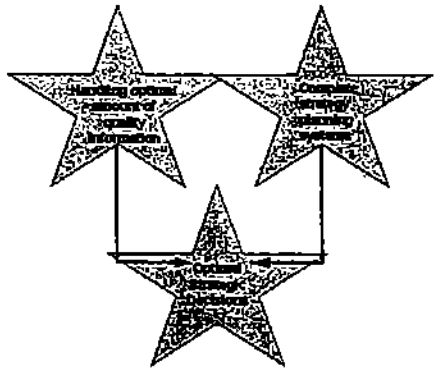

Figure 6. Optimal strategic decisions

The following ideas were presented

- Experts participate in strategy planning and required information acquisition
- People that are capable of understanding both business and technology aspects participate in strategy planning and required information acquisition
- Screening of the competitive environment needs to be done systematically and constantly
- External people transfer the knowledge

Kahru, ISMICK, 2001

- Starting with questioning the information needs
- Finding out which information already exists in the company
- Developing tools that enhance the screening of competitive environment e.g. competitive intelligence tools
- Better methods and tools to find relevant information
- Better methods and tools to prioritize the information
- Better methods and tools to analyze and to synthesize collected information
- Finding effective ways to translate experiences into knowledge and creating common knowledge
- Transferring the common knowledge and developing better tools, e.g., portals for the purpose.

The case study below discusses the information management challenges in ABB where the managers were acknowledging the need to obtain better information for technology strategy planning. Therefore, besides the traditional business strategy planning, there is a need to screen the competitive environment constantly and systematically, which is done with the described new process and tools. All the ideas listed above were included in the new process and tools that support it, hence their suitability to the practice were tested.

6. Case: Transferring Competitive Environment Knowledge

The availability of too much information on the competitive environment and, on the other hand, lack of recent, relevant and reliable information is causing information stress and fear of missing important information. The situation is recognized in ABB, where the target of development is to form better process and methods to constantly and systematically acquire, analyze and compress the on the competitive environment, and to combine the business and technology considerations.

Earlier, the individual business units were regularly asked to screen their competitive environment, to acquire and to collect information on it, and further to transfer the analyzed and compressed information to upper management. However, not enough information of good quality was presented. Due to the internal competition within the company, the presentations that managers gave to their superiors in strategy review meetings were mainly presenting strengths of their business units, but not acknowledging the real competitive environment, and its threats. Therefore, the managers felt that they were forced to make decisions without adequate and reliable information.

The solutions for the problem were first looked from developing the knowledge processes and environment. Since the business units did not have enough time or resources to screen the competitive environment, the screening had to be carried out elsewhere. This was the main motive for starting the Business Technology Evaluations, the new knowledge process that is described in this case study.

As discussed earlier, the required skills to manage the knowledge are to find, choose and synthesize existing information [Kerr 1996] and to create and transfer common knowledge which is based on the experiences of employees [Sharon 2000]. The business technology evaluations followed these ideas to find, compress, prioritize, conclude and transfer the knowledge that already exists distributed and undocumented around the company. The belief was that the better quality of information available to the managers would improve the quality of business decisions and hence increase the earnings of the company.

As the focus of the business technology evaluations were to understand the competitive environment, customer and market information as well as competitor and technology information was collected. Business Technology Evaluations aimed to answer the following type of questions: What technology do we need to please our customers and beat competition? What are our competitors doing and how? What is happening in the field of key technologies and emerging technologies? Which are the emerging markets and our key customers or targeted customers? The managers need this information e.g. information on key competitors, key customers and key and technologies, while formulating the business decision of strategic importance. The strategic actions and the R&D project portfolio are derived therefrom.

The project team that prepares Business Technology Evaluations consists typically of researches that are experts in the key technologies of a business, and it focuses typically 3-6 months on one specific issue. Team cooperates with the people in the business units, collecting the distributed pieces of information and views of the customer needs, competitive situation and technology trends. They interview different people and use their existing relationships to form the overall view of the environment. In addition, information is collected from the external sources, e.g. information about intellectual properties in a certain key or emerging technology is collected besides patent attorneys from patent databases, and information about competitive environment in a certain market segment from commercial research companies. The information is synthesized into detailed reports and further on into management summaries. Therefore, Business Technology Evaluations provide material that support the traditional business and technology strategy planning, but also are more opportunistic and innovative by their nature.

Besides creating the new process, solutions were also looked from software development. Lack of advanced tools for analyzing the competitive environment and sharing the research-based knowledge with local product responsible units and local sales offices was recognized. This need to structure and share the knowledge initiated another project, developing so called Business Technology Portals.

Business Technology Portals provide a knowledge structure and the advanced tools for collecting information about the competitive environment and the intellectual properties. The portals provide single-point of access to recent, relevant and reliable information for a specific business unit. This knowledge is organized according to the main topics; Customers and Market, Competitors and Technologies, see Figure 7. Business Technology Portals are also used to transfer knowledge within research centers, local product responsible units and local sales offices. They have advanced features, e.g., full text search from the Intra- and Internet, from attachments and Lotus Notes databases, news with push technology and advanced tools e.g., Patent monitoring tool.

Due to the accelerating changes in business and technology issues, the importance of a systematic compilation and evaluation of most recent information increases. Therefore, ABB?s technology management recently demanded a fast expansion of the business technology evaluations and business technology portals across the whole group. Also, it was decided that the portal and advanced tools are to be utilized around the year to monitor the competitive environment of each business and to review the results with the business and technology managers in so called technology review meetings. Therefore, business technology portals are used to enhance the traditional business strategy planning and technology review meetings by supporting the constant and systematic screening of the environment.

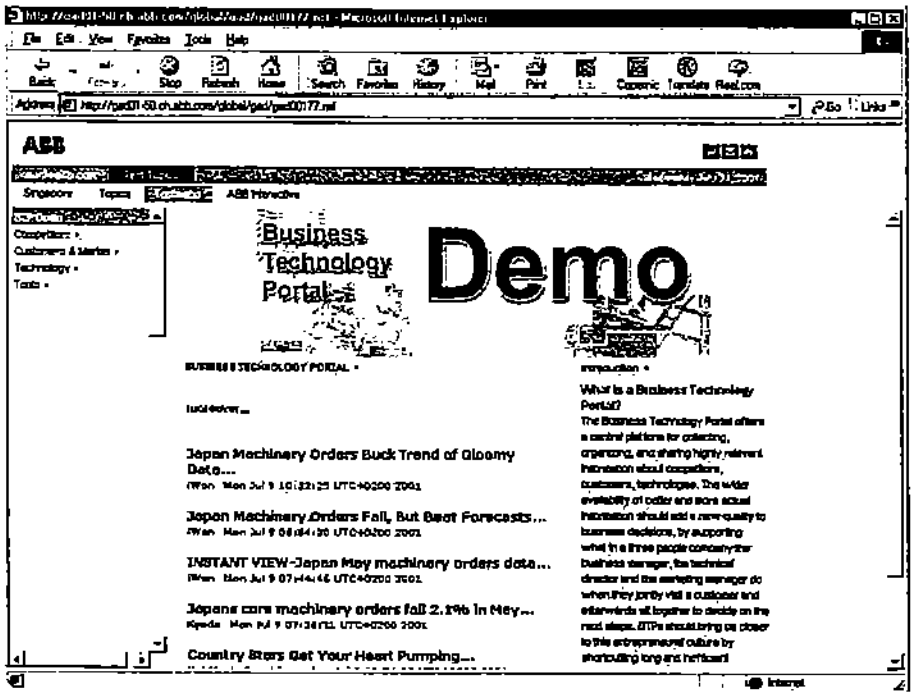

Figure 7. The front page of a Business Technology Portal.

As the case and the expansion of the methodology shows, improving acquiring and sharing of knowledge related to the strategic decision making can create significant benefits, which means that similar processes and tools could and should be widely used. Also there is a demand for software that supports the creation and transfer of the good quality information. With these actions, significant business benefits can be created.

7. Conclusions

This article explained that screening the competitive environment and joint consideration of business and technology aspects are typical problems in the strategy planning systems. Besides these challenges, management is receiving too much information but lacking quality information, that is analyzed and synthesized information. Therefore, they are under threat of making non-optimal strategy decisions.

As organizations, we need to find better ways to find, prioritize and synthesize information. In addition, we need to find methods to translate experiences to common knowledge and methods to transfer this knowledge. Strategy planning needs to be extended to consider, besides the senior management, the experts and people with business and technology knowledge, and screening the competitive environment should be done systematically and constantly. We need IT tools that enhance screening the competitive environment, e.g. competitive intelligence tools or Internet portals.

We have described an example where the target of the development is to form a better process and method to systematically acquire, analyze and compress the information on the competitive environment, and to combine the business and technology considerations. We then describe a new process of business technology evaluations, which compresses and concludes the knowledge that already exists, distributed and undocumented, in the company. The belief is that the better quality of information available to the managers improves the quality of business decisions and hence increases the earnings of the company. As the focus of the business technology evaluations were to understand the competitive environment, customer and market information as well as competitor and technology information was collected. Besides creating the new process, a software development project of Business Technology Portals was initiated. The portals provide single point of entry and knowledge structure to relevant information within a certain business and advanced tools that support the technology management within ABB.

The business technology evaluations and the business technology portals are proven a successful method to manage the knowledge in strategy planning systems, and therefore their usage is being expanded within ABB. It is suggested that this method could and should be used in other companies - and they can use this article as a source of ideas.

8. Acknowledgments

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Expertise cycle – an advanced method for sharing expertise

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Keywords *Knowledge management, Experts, Tacit knowledge*

Abstract *Sharing expertise is a growing field of interest because of the increased amount of available information, turnover of experts and globalization of companies. Sharing expertise is a difficult task; therefore, experts often lack motivation, skills and time to document their expertise. The developed expertise cycle is a framework where knowledge stewards build personal trusted relationships with experts. Knowledge stewards interview the experts, construct the knowledge and document it, making it available for knowledge seekers. The expertise cycle is tested in two cases where the expertise is distributed to different individuals and business units. In both cases the usage of the expertise cycle was expanded. As a conclusion, the usage of the expertise cycle and described best practices are recommended. Instead of providing more information we should concentrate on providing better quality of information – and the expertise cycle is a valuable method to achieve this goal.*

Introduction

> And overcome with shyness this was all that he could say:
> "I'll put it in a letter" and then blushed and ran away.
> He sat down in the grass to think of all he had to tell
> How he had met Hemulen, found a beautiful shell,
> Above all of his loneliness, particularly at night
> But though he tried so hard it seemed impossible to write.
> Now please, dear reader, comfort them and lend a helping hand,
> Help Toffle write to Miffle so that she will understand (Jansson, 1998).

As described above by Jansson, our personal observations and emotions are difficult to describe, and even more difficult to write on a piece of paper. Companies, as well as individuals, are challenged today to find solutions for describing their tacit knowledge, which is based on their employees' personal observations and emotions. The goal is not only to write down the knowledge, but also to compress the distributed expertise and to make it accessible for other employees and managers. This is required more and more due to changes in the competitive environment, e.g. the turnover of employees and globalization of companies with knowledge distributed into several countries. Enhanced methods are needed to enable knowledge retention and transfer of recent, relevant and reliable information supporting better business decisions.

This article develops an expertise cycle framework of sharing expertise, based on knowledge management and organizational learning literature. Two cases demonstrate its suitability. The expertise cycle approaches overcoming the challenge by using other people, knowledge stewards, to acquire, construct and transfer the expertise and knowledge of the experts. The article also

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explains the difficulties that are likely to arise, and how the knowledge stewards work in practice to resolve the challenges.

In the first case, experts have difficulties expressing themselves in writing and combining the knowledge of several individuals into a common knowledge, due to lack of skills, time and motivation. High turnover forces the company to solve the situation by employing technical writers who interview the experts and document their knowledge. In the second case, the aim is to enhance better decision making in strategic issues by researchers who collect, analyze, and compress distributed information.

The research method in the first case was constructive; the author was participating in transferring the knowledge being a knowledge steward herself, further developing the technical writing practice and facilitating the community of practice. In the second case, the research method was descriptive: the author was following the success and daily work of knowledge stewards, observing the practices and difficulties while developing advanced tools for acquiring information and sharing the results of their knowledge creation.

Hence, the goal of this article is to find better methods to transfer expertise when it is distributed to several individuals and locations. In addition, the suitability of the methods is to be evaluated with practical case examples.

Expertise and the role of knowledge stewards

Background

As proposed by Drucker (1988), the amount of experts has continuously been increasing, which leads to changes in a company's culture and information sharing practices. Since motivating and sharing information, instead of the traditional managing methods, lead the experts, companies are seeking for enhanced methods to share expertise and other information.

Globalization of companies has increased the amount of scattered and distributed information. Information resides in different locations of a company, distributed to different individuals and transferred in pieces that are often incoherent and in confrontation with some other pieces. Development of information and communication technologies has led us to a situation where there is too much information available. Examples are not hard to find: our e-mails and new Web pages appearing each day. Essential information is drowning into unessential, equivalent information is repeated and the information is renewing its form but not always the content. Technology and science as well as the markets are providing more and more inventions and innovations. Since the markets and technologies change fast, information becomes obsolete fast.

As a conclusion, global companies who face the challenges of global markets and fast changing technology have typically too much information, which might be overlapping, obsolete, unreliable and incoherent. These issues, along the increased turnover of the experts, are the reasons for the growing importance of sharing the expertise and compressed knowledge in an

organized and coordinated way. Since the experts and knowledge seekers are separated by location and time, crossing these borders are to be taken as requirements for the suggested transfer method.

Expertise

Polanyi (1966) has presented the idea of tacit knowledge by expressing that people know more than they can tell. However, earlier tacit knowledge had different names, e.g. practices and cognitive skills (Turner, 1994). Tacit knowledge is knowledge of practices that people have learned to do, but which they cannot explicitly describe. For example, riding a bike or driving a car is based on tacit knowledge. Describing the knowledge is difficult by using words, because an "auto pilot" guides the actions (Sveiby, 2001; Nonaka, 1991). Expertise is a category of tacit knowledge, emphasizing the uniqueness of a person's knowledge (Von Krogh *et al.*, 2000); e.g. though riding a bike is categorized as tacit knowledge, it will not be categorized as expertise, since it is a commonly mastered skill.

Expertise is based on extensive knowledge. Armed with this knowledge, the expert is prepared to respond to many situations intuitively, by recognizing the situation and evoking an appropriate answer, and in addition, by using his experience for analyzing new, difficult problems. In the daily work of an expert preserving, applying and creating knowledge are interdependent, even though the theory tends to separate the phases (Simon, 1991; Starbuck, 1992).

Owing to the nature of expertise as a special category of tacit knowledge, which is enhanced and used to innovate by testing the suitability of new ideas or existing ideas to new situations, describing and sharing the knowledge is difficult. Despite their existing knowledge and education, experts also often resist sharing their information because of their self-interest and narrow perspectives, creating additional challenges for knowledge sharing (Starbuck, 1992). In practice, this often means that experts are not motivated and skilled to document their own knowledge, or they do not have time for it since they have prioritized other tasks.

As discussed, sharing expertise is a difficult task because of its nature and lack of skills, time and motivation from the experts, but the practice of sharing the expertise is becoming more and more important to companies since the number of experts in a company increases as well as the expert turnover.

Transferring expertise

Turner (1994) has presented an idea that practices, tacit knowledge, have a two-level structure, consisting of individual substance and historical substance, which leads to three locations of practices: collective object solutions, private solutions and dualistic solutions. He points out that public knowledge, collective object solutions, such as rules, conventions and ideologies are most often transferred with public objects, as texts, e.g. a law book. But he also ends into acknowledging the difficulties to solve the problem of transferring practices. Also Nonaka (1994) explains that unless knowledge is explicit, it

cannot be easily leveraged. The idea of transferring knowledge in documented form, as explicit knowledge, fits well to the purpose of transferring knowledge when time and location separates experts and knowledge seekers.

The most logical solution is that experts document their knowledge themselves. However, as discussed earlier, this is not often possible because of the nature of expertise and experts. Experts often lack the writing skills and time as well as motivation to share their knowledge. In addition, in global companies documents should be written in English, which creates additional challenges for experts with poor English skills. Therefore, we have a conflicting situation where the documented knowledge is needed but it is difficult to convince the experts to write.

On the other hand, it can be noticed that people are often willing to help others by sharing knowledge, especially when there is a personal benefit to them, e.g. a smile from a person they like. Dixon (2000) discusses this phenomenon. Therefore, we need to develop alternative solutions for how to document their knowledge. The proposed alternative solution is to use other people to document the expert's knowledge. Using other people to document knowledge is proposed by many authors, e.g. Sheehan (2001), Dixon (2000) and Leistner (2001), who emphasize that sharing tacit knowledge should be someone's job, otherwise the information will not be written down. However, it is still not a common practice in companies to employ people to document other people's knowledge.

Knowledge stewards

External people, who write down experiences and knowledge of others, are called knowledge stewards in recent literature. Knowledge stewards are people dedicated to acquire information from an organization, further analyzing and formulating it to a form that is useful for knowledge seekers. The role is mentioned in several knowledge management books and articles, e.g. Sasson (2000) and Leistner (2001) explain that knowledge stewards interview and observe people in their work environment to capture what they know, to further document what they have learned and make the knowledge available for the entire organization.

When should the knowledge stewards be used? It is recommended to use them to document knowledge when:

- *Documenting the information is especially challenging.* It consists of tacit knowledge that is embedded in people's minds, experiences, emotions and intuitions or when the reader's needs are not known.
- *Knowledge is distributed, e.g. into different countries.* If a person that owns the knowledge and a person that seeks for it, are working in the same location, the information can be shared through informal conversation or using knowledge brokers who know the experts in each field. However, if the pieces of information are distributed, forming a

common knowledge, e.g. collecting and compressing the knowledge, it is more difficult.

- *Information is of great importance to a company.* The method causes costs, so it should only be used when the benefits of having the information available outweigh the additional cost (Dixon, 2000; Sasson, 2000).

We have concluded that knowledge stewards could be used to document the expertise. However, this does not relieve experts from sharing their expertise. The knowledge stewards still need to acquire knowledge from the experts. How could they do this?

Sharing expertise

For sharing tacit knowledge, most of the sources, especially the earlier literature, recommend a mixture of techniques including observation and imitations. However, experts tend to use their knowledge creatively, improving and developing the used methods constantly and adapting to new situations, sometimes even without reasoning. Therefore, observation and imitation cannot reach the internal models of an expert, e.g. the reasoning and justification of certain actions, only the external behavior, so observation of an expert cannot be a successful method to transfer the expertise.

Mentoring is a powerful method to transfer expertise, but it is suitable only when the expertise is not distributed to several individuals and locations, and especially when the experts and knowledge seekers are separated by time. Nonaka (1994) suggests metaphors and analogies but they are not suitable methods for transferring big amounts of expertise. Story telling is another method to share tacit knowledge and values, used to reach and convince large amounts of people. Therefore, for the purpose of transferring technical or strategic information, expertise, it is not suitable. However, story telling also uses the same techniques as proposed for knowledge stewards earlier, interviewing, observing and creating the trust to acquire information that will be used for the stories (Snowden, 1999).

The recent literature suggests interviews to transfer this kind of knowledge. Although describing tacit knowledge is difficult, it is not impossible and a professional interviewer can help the expert to describe his knowledge. In addition to interviews, also the importance of a company's culture is emphasized. Knowledge sharing places demands on organizational relationships. Constructive and helpful relations enable people to share their insights and discuss freely, sharing common experiences and their concerns. For example, Geus (1997) explains with the help of birds who learned to open milk bottles in England, that instead of managing knowledge we should create conditions and culture in which learning and sharing takes place. Von Krogh *et al.* (2000) who explain that ba, enabling context, is a "place in which knowledge is shared, created, and used" also emphasize the enabling context.

Interviewing

Interviews are suggested to be the method to transfer expertise by many authors, e.g. Sveiby (2001) suggests that tacit knowledge should be shared with the help of dialogues and debates, but warns that most of the information is lost in the conversion to explicit information. So how should the interviews be carried out? Brooking (1998) emphasizes that since tacit knowledge cannot be shared, the interviews should focus on capturing the processes used by the expert and documenting the assumptions and conclusions in certain situations.

As the interviews should focus on capturing the processes used by the expert and documenting the assumptions and conclusions in certain situations, the interaction between two persons sharing their experiences, emotions and mental models is a demanding situation. While discussing the mental models of others, individuals need to analyze their own at the same time, which requires a good relationship between the participants and a supporting company culture (Von Krogh *et al.*, 2000).

Several authors, e.g. Brooking (1998) and Sveiby (2001), have presented trust as a band for knowledge sharing; without it tacit knowledge cannot be captured at all. Von Krogh *et al.* (2000) explained the importance of trust by the fact that whenever we share a piece of knowledge, we have to justify our beliefs; this is challenged by self-doubts, fear of going against norms or the overall need for standing up for one's own ideas. Justification makes knowledge sharing such a fragile process. In addition, as Dixon (2000) emphasizes, experience is a poor teacher, since the relationships between the cause and effect are often complex, and the interpretation relies quite heavily on fallible human memory. Therefore, building a relationship that enables sharing emotions, observations and justifications requires several shared experiences and the trust builds on them.

Several authors mention, e.g. Sheehan (2001), the feedback loop that should be used for interviewing the experts. This means that after the first interview, the subject's knowledge is constructed and transferred to a written form. The text is then brought back to the expert who has a chance to correct and add new information; in addition some additional interviews might be needed.

Framework for sharing expertise

From the discussed literature, the conclusion is that the most recommended method to learn from experts is to interview them. By using interviews and observations, the external behavior and parts of the reasoning made by experts can be documented, but their internal models only partially. Trust and personal relationship with people interacting in the interview is the basis for good results for knowledge acquisition.

As a result of the interviews, knowledge construction begins. The knowledge stewards form their own internal models of the issue and document them, transforming them into explicit knowledge, written descriptions and instructions. Feedback loop with the expert assures the quality of the content.

Other people learning about the subject, who, based on the documents, can easily use the resulting text and their own experiments, create their own mental models, their tacit knowledge about the issue. The phases are called information distribution and interpretation in the framework, expertise circle, which is used to simplify the ideas of sharing the expertise (see Figure 1).

The expertise cycle shows how the expertise can be transferred, preserved and increased; it also implies that the practice is rather a continuous process than a single project. The expertise cycle has the following phases: knowledge acquisition, knowledge construction, information distribution and information interpretation.

The expertise cycle resembles the knowledge spiral presented by Nonaka (1994) and later by Von Krogh *et al.* (2000). The knowledge spiral presents four interactions to an overall enabling context: originating, conversing, documenting and internalizing. The main differences between the models are the emphasis on knowledge transfer vs knowledge creation, the type of knowledge, physical location of the knowledge and the amount of owners of the original knowledge.

The expertise cycle explains sharing the expertise in an organization, whereas the knowledge spiral emphasizes creating new knowledge and innovations, e.g. conversing the knowledge with group conversation and forming the concepts within a group. The expertise cycle is used as a framework to transfer a special category of knowledge, expertise; the focus of the knowledge spiral is more generic. In addition, the expertise cycle is used to transfer knowledge that is distributed to different locations, whereas the knowledge spiral suits better for transferring it when the knowledge resides in the same location, due to conversing phase with group conversations. The

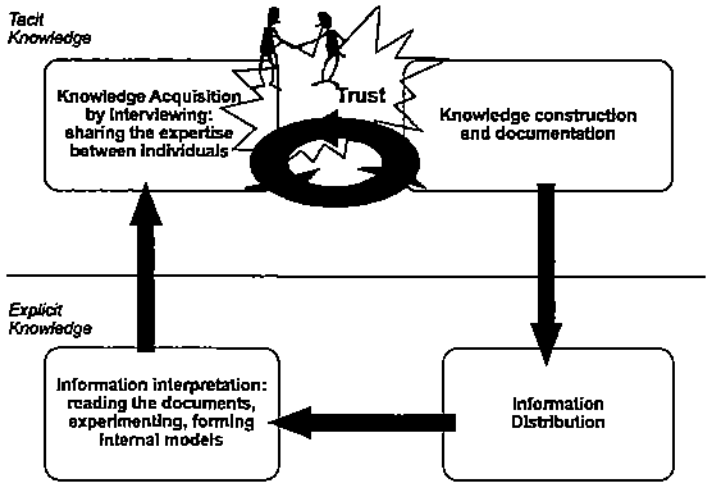


Figure 1.
Expertise cycle, the framework for sharing expertise

knowledge spiral is also focused on combining knowledge of several individuals at the same time while expertise cycle concentrates on sharing the knowledge of one expert at a time. The common idea in the models is the cycle where tacit knowledge is transferred into explicit knowledge, and vice versa.

As discussed, there is a wealth of information concerning tacit knowledge. Some articles and books also describe the role of knowledge stewards, explaining why and when they should be used. But as of yet there is no sufficient understanding on how the knowledge stewards work in practice, which kind of challenges they need to conquer and the overall success of the method in companies. The lack of good applications to manage tacit knowledge is also acknowledged by Sternberg and Horvath (1999) who explain that better applications can be acquired by understanding tacit knowledge in organization as a pragmatic phenomenon. This pragmatic approach is applied here.

It is claimed that the knowledge steward method and the created expertise cycle framework are successful in sharing the expertise; this is verified with two case studies. It also expects that typical problems in sharing expertise within the proposed framework will appear, and shares the best practices that are used in the case companies to conquer them. Companies should acknowledge the expertise cycle, the challenges and the proposed best practices in order to transfer their expertise successfully.

Knowledge stewards transferring expertise – two cases

Case 1. Transferring technical expertise

This first case describes a situation in an ABB company, where experts have difficulties in expressing themselves in writing and combining the knowledge of several individuals into a common knowledge, due to lack of skills, time and motivation. Also, since knowledge is distributed to several individuals, locations and at different times, e.g. software has largely been created before most of the current employees have started to work for the company, constructing a common understanding and knowledge of the whole technology is a demanding task.

As a consequence, the company has the following problems related to its knowledge:

- The knowledge of parts mostly created in the past is undocumented.
- High turnover of experts; the expertise must be documented.
- The expertise is difficult to describe due to its tacit nature, experts lack the skills to document it.
- The information is distributed to several individuals and locations.
- The lack of information creates a significant amount of additional work and costs, e.g. to internal customers and technical support.

Applying the expertise cycle solves the situation, which means employing people, technical writers, to interview and document the knowledge of the experts.

Knowledge sharing and retention becomes extremely important in an organization with high turnover of experts. Today this is common in IT companies where the experts often change their position or company, therefore the software products of companies have a longer life cycle than people. Since people that developed a product have the knowledge of how it is designed, how it works and how it is to be used, it is critical that this information is preserved. If the knowledge walks out the door, a company will have problems with the product. Therefore, transferring product knowledge is extremely important for enabling the expertise retention.

Often experts are asked to document the software, describe functions and their usage. However, typically technical experts are not interested in writing. As an additional challenge for a global company, the technical documentation is to be written in English. When experts that are asked to document their knowledge have neither the interest in writing nor the required language skills, this results in a poor quality of documentation. In the times of expensive computing power the company culture accepted poor quality of documentation and lack of information. There were even unwritten rules like "Code should not be documented to avoid delays in the program execution". Since the software still included parts from those days and most experts had left R&D, only a few people knew the software behavior.

The lack of proper documentation was evident, having all the typical symptoms: engineers using the software were calling to technical support for advice, complaining about poor documentation. Since technical support received a huge number of calls, they had difficulties in answering and the amount of people in technical support had to be increased. Further, technical support had no proper product information available, so it started to redirect customer phone calls to R&D.

In addition, customers started to call directly to the product expert whenever they had problems. This was not appreciated in R&D as the customers were asking "stupid questions" that could have been solved in technical support. This led to sarcasm and unfriendly customer service, e.g. "Now I will read aloud the section in the manual." Customer satisfaction, which already was low because of product problems and the unsatisfactory documentation, continued to decrease.

The problems of using undocumented software also created costs to internal customers in different countries, technical support and R&D, where the experts used their time to advise the customers instead of doing their own work as product developers.

We have now seen the kind of problems lack of transferring technical knowledge created. The background of this case can be summarized with the following symptoms:

- The knowledge of parts mostly created in the past is undocumented.
- High turnover of experts.

- The expertise is difficult to describe due to its tacit nature, and experts lack the skills to document it.
- The information is distributed to several individuals and locations.
- The lack of information creates a significant amount of additional work and costs, e.g. to internal customers and technical support.

The first attempt to solve the problem was to motivate the experts to write by emphasizing the importance of documentation. In addition, customer calls were to be directed to technical support and if a question remained unsolved, the technical support contacted the experts and mediated the answer to the customer. Customer satisfaction was improved a little and some explicit knowledge was documented, for example object and attribute descriptions. But even after motivating, giving orders and arranging more time for product experts, the overall problem remained unsolved. Experts still lacked both the skill to write and the English language, as well as the knowledge of customer needs and confidence in their superior expertise.

A decision was made to use a new method for knowledge transfer: hiring new people to document product knowledge, who were to be placed in the same departments as the software engineers; they started to participate in project meetings, to study the products and to build their relationships with product experts. Based on what they heard, read and experimented, they formed basic knowledge of the products and improved the existing documentation. In addition, the customer needs were investigated. While writing they interviewed the product experts to find out product details. Afterwards product experts who inspected the documents made some corrections and clarifications. The quality of documentation started to improve significantly. The expertise cycle framework and the roles described here in this case are presented in Figure 2.

As more technical writers were hired, their role was officially described, for example in product development handbooks and process descriptions. The knowledge stewards were called technical writers. As the expansion of the method proves, the expertise cycle was a successful method to transfer expertise in the case company. However, small improvements were realized in practice to enhance the success of technical writers' work.

While working mainly with software engineers, the technical writers sometimes felt frustrated and unappreciated; a change in the company culture did not happen overnight. Technical writers formed a group, a community of practice, which met regularly. The aim was to develop common methods, to learn together as well as to share the best and worst practices.

The technical writers group acknowledged the need for better tools for knowledge construction, e.g. better tools to write and manage terminology and overlapping information in different places. So, several projects were initiated, e.g. developing a term bank with common terminology and improving documenting methods by investigating new technologies and ideas, e.g. SGML and related tools.

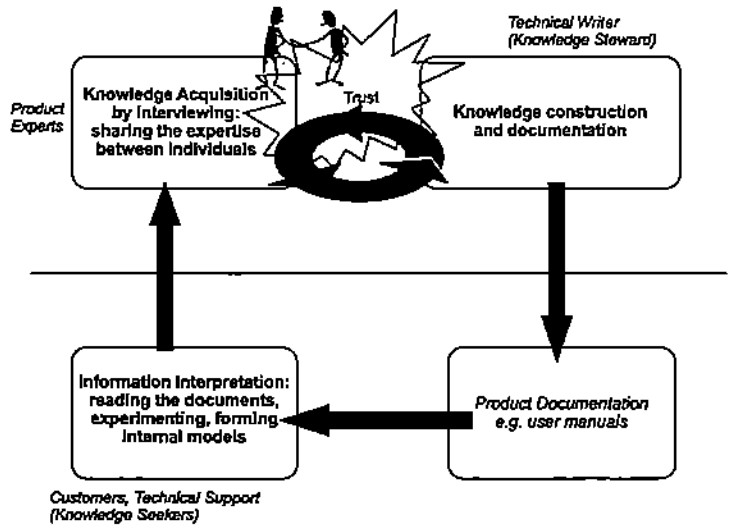


Figure 2.
The expertise cycle in case 1

Note: The technical writers interview product experts, construct the project knowledge and transfer it as product documentation to customers, technical support, new employees etc. who use the documentation to create their own knowledge

However, the biggest challenge the technical writers faced was the cooperation with software engineers, acquiring the needed knowledge from them by interviewing or by other methods. Interviews were the best acquisition method, e.g. mails were rarely answered properly; however, it was still difficult to get the time from the expert for an interview or for reviewing the existing writings. Surprisingly, the personal relationship with product experts became the most important asset for the technical writer.

The conclusion of this case is the acknowledgement that documenting the expertise, distributed to different individuals and locations, is difficult, because of the experts' lack of skills, time and motivation. On the other hand, high turnover of experts and the costs that lack of documents causes, forces the company to solve the situation by employing people, technical writers, to document the expertise. Technical writers interviewed product experts, constructed product knowledge and transferred it as product documentation to the customers, technical support, new employees, etc., who use the documentation to understand the product and its usage better. As the expansion of methodology shows, the expertise cycle is a successful method to transfer expertise. In addition to the methods described in the expertise cycle, in practice the knowledge stewards formed a community of practice to share their experiences and best practices and to initiate the necessary development projects.

Case 2: Transferring competitive environment knowledge

The second case describes the background and developed methods in ABB, aiming to enhance better decision making in strategic issues. As background for the case, global companies like ABB face the challenges of global markets, fast changing technology and explosion of information. As a consequence, they typically have the following problems related to its knowledge:

- There is too much information transferred every day and people feel frustrated trying to handle all the information they receive.
- The information resides in different parts of the company, distributed to different individuals.
- The information is transferred in pieces that are often incoherent, unreliable and in confrontation with some other pieces.
- The markets and technologies change fast, therefore, information becomes obsolete fast.

The issue is solved by employing researchers who collect, analyze, and compress distributed information. The management uses this analyzed and compressed knowledge as a basis to make strategic decisions. The case uses the expertise cycle, consisting of employing so-called knowledge stewards to acquire, construct and transfer expertise, and proves it to be a suitable and successful method.

In a global organization, in which relevant information is distributed over many locations and individuals, information needs to be collected, analyzed and compressed. In addition, it is extremely important to develop better methods to transfer knowledge and to improve the quality of information, transferring and creating information that only fits the user's needs. Often this is not done systematically, and information of good quality is not easily available.

Our case company suffered from all of these typical symptoms, blaming its difficulties to arise from improper information management. Different competence centers and product responsible units developed their own expertise respectively to their responsibilities. But common knowledge of an issue was lacking in all the other centers as well as in the headquarters. Despite the information flood that managers were facing daily, not enough recent, relevant and reliable information was available.

Even though the individual business units were regularly asked to document their knowledge and hence help other centers to learn from their experiences, not enough information of good quality was presented. The knowledge that was collected in the companies was not systematically transferred to upper management and other units. In addition, due to internal competition within the company, the presentations that managers gave to their superiors were mainly presenting strengths of their business units and how well the individual company was doing, but not acknowledging the real

competitive environment, and especially its threats. Therefore, managers felt that they were forced to make decisions without adequate information.

We have now seen the kind of problems lack of transferring technical knowledge created. The background of the case can be summarized with the following symptoms:

- Too much information transferred every day, therefore, people feel frustrated.
- Information resides in different parts of the company, distributed to different individuals.
- Information is transferred in pieces that are often incoherent, unreliable and in confrontation with some other pieces.
- The markets and technologies change fast, therefore, information about them becomes obsolete fast.

Since the business units did not have time to screen the competitive environment, and document their analyses and knowledge, this work had to be carried out elsewhere. These were the main motives for starting the practice of business technology evaluations (BTEs) that is described in this case study.

The motive for the BTEs was:

- information overload the management faces daily;
- lack of recent, relevant and reliable information.

The idea was to analyze, compress and summarize the knowledge that already exists distributed and undocumented in the company. The belief was that the better quality of information available to managers would improve the quality of business decisions and therefore, increase the earnings of the company.

As the focus of BTEs was to understand the competitive environment, customer and market information as well as competitor and technology information about a specific business issue was collected. The managers need this information, e.g. information on key competitors, key customers and key and emerging technologies, while formulating the business decision of strategic importance. Strategic actions and R&D project portfolio are derived therefrom.

BTEs aim to answer the following type of questions: What technology do we need to please our customers and beat competition? What are our competitors doing and how? What is happening in the field of key technologies and emerging technologies? Which is the emerging market and who are our key customers or targeted customers? These questions are answered by forming a project, focusing typically three to six months on one specific business.

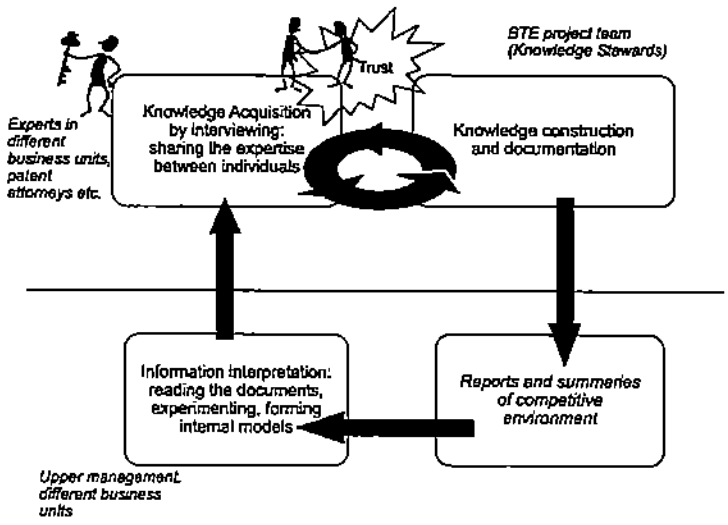
The project team that prepares a BTE, typically consists of researchers that are experts in key technologies of a business. To achieve the analyzed and compressed knowledge, researchers collect distributed business and technology information from different individuals and locations within a company. They cooperate with people in business units, collecting distributed pieces of information and views of customer needs, competitive situation and

technology trends. They interview different people and use their existing relationships to form an overall view of the environment and summarize this knowledge into analyses and new reliable and compressed knowledge.

In addition, information is collected also from external sources, e.g. information about intellectual properties of a certain key or emerging technology is collected together with patent attorneys from patent databases, and information about the competitive environment in a certain market segment from commercial research companies. The information is concluded into detailed reports and further on into management summaries. The expertise cycle and the roles described in this case are presented in Figure 3. Besides the successful deployment of the expertise cycle in this case, small improvements were realized in practice. These improvements are described here.

The researchers that compress this information of strategic importance to businesses, are quite often doing only one or two BTEs, so the best methodology to acquire information and the sources of relevant and reliable information are not familiar to them when they start a BTE. In addition, researchers might have problems to define and limit the research problem. To solve these issues, the researchers started regular meetings among themselves, together with the manager organizing the BTEs, forming a community of practice.

All the new BTEs were presented in community meetings after the pre-study and planning phases. The goal of the presentation is to receive guidance



Note: The BTE project team acquires information from various sources and constructs its own knowledge about the competitive environment of a certain specific business and then documents this knowledge into management reports and summaries

Figure 3.
Expertise cycle in case 2

from other BTE researchers and the responsible manager. Opinions, views, and impressions were to be freely discussed in order to create better results. In addition, the finished reports were presented as an example to the ones that were still in progress or just starting. The practice of BTE meetings was found to be an effective way to transfer the experience and best practices.

The BTE group recognized the lack of better tools for analyzing the competitive environment, sharing information and links among themselves and further transferring the research knowledge into business units. The need to transfer the best practices as well as the research based knowledge into local product responsible units and local sales offices initiated another project; business technology portals. These portals are used to provide a knowledge structure and advanced tools for screening the competitive environment and making strategic business decisions. Business technology portals are used by all the people who collect, share or search information about a business unit's competitive environment, e.g. information on competitors or intellectual properties. They are also used to transfer knowledge from researchers and research centers into local product responsible units and local sales offices. The advanced tools are to exploit competitive intelligence providing a process for analyzing the competitive environment from the Internet as well as patent databases and other relevant information sources.

Owing to accelerating changes in business and technology issues, the importance of systematic compilation and evaluation of the most recent information increases. Therefore, ABB's technology management recently demanded a fast expansion of the BTE methodology across the entire group. In addition, it was decided to expand the methodology, the portals and the advanced tools to be utilized each year to monitor the competitive environment of each business and review the results with the business and technology managers in so-called technology review meetings.

As the case and the expansion of the methodology shows, improving the sharing of knowledge related to strategic decision making can create significant benefits, which means that the usage of a knowledge steward to document the expertise is profitable, regardless of the costs that are involved.

As a conclusion, global companies who face the challenges of global markets and fast changing technology have typically too much information, which might be overlapping, obsolete, unreliable and incoherent. To accomplish a better quality of information for strategic decision making, the expertise cycle framework is used. The BTE project team acquires information from various sources and constructs their own knowledge about the competitive environment of a certain specific business and then documents this knowledge into management reports and summaries. As the expansion of the methodology shows, the expertise cycle is a successful method to transfer expertise. However, in addition to the expertise cycle, the knowledge stewards formed a community of practice to share their experiences and best practices and to initiate the necessary development projects.

Conclusions

This article has described sharing expertise. Three main reasons for the growing interest in this field of knowledge management are recognized: explosion of available information, increased turnover of experts, and globalization of companies. Because of the explosion of available information and our limited ability to process it, we need analyzed, reliable and compressed information. Because of the high turnover of experts, we are forced to document the expertise to retain it and due to globalization of companies, the information is widely distributed. Even though experts would be willing to share their knowledge, the distribution of knowledge to several individuals and locations creates challenges; documenting this knowledge is a demanding and time-consuming task, therefore the experts often lack motivation, skills, and time to do it.

An expertise cycle framework is created based on the knowledge management and organizational learning literature. In the knowledge cycle, knowledge stewards build personal relationships with experts, to create trust that enables knowledge sharing; they interview the experts and form their own internal models, which are documented, checked in interaction with the experts and transferred to the knowledge seekers. The knowledge seekers use the compressed and documented information to learn about the issue.

While formulating the expertise cycle, the method was tested in two cases. In both of them the expertise was distributed to different individuals and business units, who despite the requests did not compress and document it. The case studies showed that the initial expertise cycle was not complete. What was lacking? Knowledge stewards faced challenges daily, and to solve them, they formed communities of practice. The communities learn together, share the best and worst practices and initiate systematic process and tool developments.

Companies that employ knowledge stewards should know the existing experiences to better anticipate the challenges they will face. They should also be aware of the presented best practices: communities of practice, development of better methods and tools to enhance the knowledge acquisition, construction and distribution.

In both cases, the benefits of using knowledge stewards were bigger than the associated costs, and the framework usage was expanded. Hence, the expertise cycle was successfully implemented in the companies. Based on the experiences, the usage of knowledge stewards and the expertise cycle is recommended. Instead of providing more information we should concentrate on providing better quality of information, by compressing and analyzing it – the expertise cycle is a valuable method to achieve this goal.

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Internet-Based Scanning of the Competitive Environment

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Abstract

Purpose

Adjusting company to its competitive environment is often done without proper knowledge of the competitive environment. This paper describes methods and tools that could be used to improve Internet based scanning of the competitive environment. In addition, the paper describes an example where such methods and tools are used.

Methodology

Existing literature on environmental scanning, competitive intelligence and benchmarking is reviewed to brief the theoretical background, and to find new ideas to improve scanning of the competitive environment. Using theory-building approach, the research is based on constructive methodology. The construction is done in ABB Corporate Research, in the Business Technology Portals project.

Finding

Experts scan the environment using the advanced tools, interviews and knowledge sharing, and managers mainly scan by discussing with other people. Modern search engines can be used to build advanced tools that enhance competitive environment scanning and benchmarking on screening level. Search engines acquire and analyze information from Internet, e.g. from news,

company Internet pages, patents and databases. The methods reduce the time needed for acquiring information, enabling people to concentrate on analyzing the information.

Research and Practical Implications

For practitioners, the article provides an example of framework, methods and tools that can be used to scan the competitive environment. For researchers, it provides a literature review of the topic with an innovative construction.

Originality/Value

The theoretical background has been innovatively applied to construct and to deploy very pragmatic tools that enhance scanning the competitive environment.

Key words: Scanning, Competitive environment, full-text search, Internet

Introduction

Strategic planning is one of companies' key tasks, foundation for their success. However, the strategic planning process and scanning the competitive environment has not been developed like other processes. Consequently, information for strategic decisions is acquired without adequate tools and methods, reducing possibilities for fact-based management. Since strategic planning is done by busy managers, support, rationalization and automation of associated tasks can create significant benefits.

The goal of this article is to give a practical example and a description on better methods and tools, based on modern search engines and advanced search techniques, to automate and to rationalize acquiring and analyzing information of the competitive environment for technology strategy planning purposes. The described methods and tools can be used for Internet-based scanning of the competitive environment and for benchmarking on screening level, either by top managers or by the experts of a company. Internet based scanning is selected because the tremendous amount of free and useful information that is available for users who know how to find it and how to benefit from it.

Even though publications describing the importance of the competitive environment scanning exist, and they describe the need for systematic and continuous process, Internet based scanning is quite new field to practice - only few publications describe deployed constructions and case studies using such a process. However, scanning the competitive environment does not differ much from benchmarking practices on screening level, which have been described earlier, e.g., by Matthews and Lave (Matthews and Lave, 2003).

Benchmarking on screening level was earlier presented and deployed as the best tool to measure the competitiveness. Benchmarking on screening level consists of benchmarking on-line, competitive benchmarking or partners benchmarking (Zairi, 1994). Common idea in competitive benchmarking and in scanning the competitive environment is utilizing public data. The data is used to evaluate and to compare performance of different companies within the same competitive environment.

As Internet is the most exciting source of the competitive environment, this article discusses the role of Internet as the source of competitive environment information and how such information

could be effectively acquired from different types of sources within Internet. The topic is also interesting and relevant, because most western companies aggressively push into new Asian and Latin American markets, which they do not know well. The article demonstrates an example of a process, associated tools and methods that were deployed within ABB, and it discusses similarities of competitive benchmarking and scanning the competitive environment, and finally points out that such tools and methods could be used for benchmarking purposes as well.

The article first presents the research goal and the methodology that has been used. Then it reviews briefly the literature related to the study and presents the most interesting ideas found from the literature. Then the article describes the context in which the study was carried out, as part of the Business Technology Portals research project. After the context has been described, the article describes the used Internet information sources, and which advanced methods and tools were used to acquire and to analyze information from each source.

Research Goal and Methodology

The research question of this study is

What kind of methods and tools could be used to improve Internet based scanning of the competitive environment?

Even though the article is very practice oriented, existing literature, e.g. Environmental Scanning, Competitive Intelligence and Benchmarking, has been reviewed to brief the theoretical background of the study, and to find ideas that could be used to develop the tools and methods. The study follows the theory-building approach (Eisenhardt, 1989), instead of the theory testing approach that is more commonly used. The basic selection of research strategy is to use constructive research. The construction is based on the work done in ABB Corporate Research, with the Business Technology Portals project, whose project manager the author was. The construction is tested using weak market test.

As the constructive research combines empirical and normative features of research, it enables to solve relevant problems of business management by creating innovative models, frameworks, methods and other constructions, and to test the functionality of the constructions during the research process (Olkkonen, 1993). These characters and their match to the research question have been the essential part for deciding to use the constructive research. Full objectivity or

generalization is not in the focus of the article. Rather the aim is to create in-depth understanding of the phenomena and to develop a construction that is suitable for the situation.

As conclusion, the choice of methodology has been primarily affected by the research objective, secondly, novelty of the research topic and thirdly the possibilities of the author to deploy the constructions.

The study started with creating initial framework, empirical observations and a collecting information presented in the literature, after which insight emerged. The interaction of the research process and the earlier literature was continuous during the whole research, making the process iterative; constructions have been linked to the environmental scanning literature continuously.

Technology Strategy Planning

The importance of the technology strategy has been explained by Steele, who states that every strategic plan contains an implicit technology forecast, e.g. assuming that present technology and its extensions provide an adequate base for success (Steele, 1989). In addition, one of the essential strategic decisions is directing research and development investments – resulting in significant time and money commitments.

As originally presented by K. R. Andrews, strategy is a unifying idea that links functional areas and activities of a company to its competitive environment (Montgomery and Porter, 1991). The fit between critical competencies of a company and its environment defines its success. Hence, adjusting company to its competitive environment is one of the most important tasks of a company. However, it is quite common to concentrate on the other part of the strategic planning, which is developing an integrated, coordinated and consistent long-term plan of action (Lorange and Vancil, 1976, Montgomery and Porter, 1991).

Competitive Environment

According to Fahey, detecting, anticipating and understanding the competitive environment is the basis for outmaneuvering and outperforming the competitors (Fahey, 1999). Besides competitors, competitive environment contains the underlying economics and so called competitive forces,

which are threat of new entrants, bargaining power of suppliers, bargaining power of customers and threat of substitute products (Porter, 1979).

The leading drivers of strategic change in our current environment are globalization and technology innovations. Their implications to competition have been described by many authors, e.g. Bradley, Hausman and Nolan (Bradley, Hausman and Nolan, 1993), and Nordström and Ridderstrale (Nordström and Ridderstrale, 1999). According to Bradley, Hausman and Nolan (1993), leading change in technology will be a fusion of information technologies and telecommunications, resulting in creating new industries, restructuring existing ones and changing the way companies compete. Similarly, other new technologies can change our competitive environment, by changing one or several competitive forces.

Scanning the Competitive Environment

As explained, scanning the competitive environment is important part of strategic planning, which is often not done properly. This section explains different kind of scanning practices and next sections further on provide ideas that could be used to enhance the scanning in many companies.

Scanning the competitive environment has been described in environmental scanning literature. Environmental scanning is defined as acquisition and use of information about events, trends and relationships in the environment of a company, the knowledge of which would assist management in planning the organization's future course of action (Aquilar, 1967, Choo and Auster, 1993). Environmental scanning can be continuous, periodic or irregular (Choo, 2001). Continuous scanning is focused on opportunity finding and contributing proactively to the organization. Irregular scanning is reactive scanning, general exposure to information without any specific purpose. Periodic scanning is more sophisticated, but still focused on problem solving and forecasting with limited scope and methodologies. (Van Vuuren, 2001)

Despite the articles describing importance of scanning, systematic scanning is virtually non-existent – scanning for planning, irregular scanning, is more common. (Liu, 1998, Xu and Kaye, 1995). Due to globalization and fast changing markets, the best companies have realized that success demands that an organization scans its environment constantly, that is periodically and continuously - too often, though, scanning is done without adequate time and results (Gendron, 1998, Prewitt, 1998).

To improve scanning, Choo proposes to utilize the specialized knowledge of industry experts, to outsource some scanning and to use information technology to guarantee the variety of results, e.g. using automatic searches, push channels (Choo, 1997). Other authors seem to agree, e.g. Underwood (2002) has described the options for an organization to be: using internal intelligence team, using external consultants or using hybrid intelligence system.

Utilising Experts and Information Technology in Scanning Process

Since managers do not have enough time, they should involve experts and information technology in scanning the environment

Pirttilä has divided the competitive environment scanning into two parts:

- Informal scanning, mainly based on "mouth to mouth" information and informal networks
- Systematic scanning, based on public information available in the competitive environment. (Pirttilä, 2000).

Several authors have described that people typically rely on their informal networks when acquiring information, and settle for information that is "good enough", rather than seeking the perfect information, e.g. Cross and Borgatti (Cross and Borgatti, 2001). This is consistent with the results on how managers acquire information, e.g. Pirttilä states that informal networks and social contacts are especially important to managers, who, due to lack of time, delegate their knowledge acquisition to their networks (Pirttilä, 2000). Other people are considered the best information sources for competitive environment scanning by many authors, e.g. Prusak and Cross (2001). In addition, the results of systematic competitive environment scanning are mostly utilized by experts who have more time to read than managers (Pirttilä, 2000).

Competitive Benchmarking

Environmental scanning practices do not differ much of practices earlier presented and deployed as one form of benchmarking, which was already decades ago, regarded as the best tool for measuring the competitiveness. (Zairi, 1994) This form of benchmarking has been called benchmarking on screening level and it was presented as a solution to companies who found benchmarking expensive, time consuming and problematic practice, due to their limited resources. Benchmarking on screening level is often done using public information about companies. E.g.,

balanced scorecard or Malcolm Baldridge National Quality Award criterias could be used for benchmarking, these pieces of information are often publicly available (Rickards, 2003, Lobo, Zairi, 1999) Benchmarks on screening level can be divided into competitive benchmarking, partners benchmarking and benchmarking online. (Lau, Lee and Peter, 2001, Zairi, 1994) According to Cassell, Nadin and Gray, most popular factors to benchmark have been financial performance, customer satisfaction and quality of products (Cassell, Nadin and Gray, 2001).

Even though financial performance, customer satisfaction and quality of products are important for success, benchmarking those factors is not the optimal way to benchmark when limited resources are available. Rather, benchmarking and other kind of acquisition of information from the companies within the same competitive environment should concentrate on issues that have been recognized as the key success criteria or core competencies in that specific competitive environment. The background for such statement is the claim that the fit between critical competencies of the company and its environment defines its success. This kind of benchmarking approach has been presented by Lobo and Zairi, proposing that benchmarking should start recognizing core issues within the competitive environment. Those core issues shall be benchmarked between the companies, to develop a profile for each company (Lobo and Zairi, 1999).

Common idea in benchmarking on screening level and in environmental scanning is comparing public data to evaluate performances of different companies competing in the same competitive environment. The use of public data for benchmarking, instead of confidential data, has been promoted for clearly obeying intellectual property and competition law (Boulter, 2003). Environmental scanning and competitive intelligence can be regarded as new coming of competitive benchmarking on screening level. The survival of the practices over the decades proofs its vitality an importance.

Competitive Environment Information in the Internet

On-line information, e.g. Internet, is considered better source than most of the hard copy publications (Lackman, Saban and Lanasa, 2000). Since on-line resources, especially Internet, have not been widely used for long and tools that support and ease their usage can be enhanced, it is forecasted that Internet-based knowledge acquisition will grow dramatically during the next years. This trend has been verified by some studies, e.g. investigation made by Kumar and Palvia,

2001, who state that online databases, suppliers/customers/trade associations are the most interesting external information sources (Kumar and Palvia, 2001). In addition, Kahaner (1997) estimates that the public on-line information is the most exciting trend in the competitive intelligence and in EIS (executive information systems) (Basu and Poindexter, 2000). These statements support the claim presented in the Introduction, that Internet is currently the most exciting information source for scanning the competitive environment.

Since the information in the Internet is available to everybody, the competitive advantage has to come from acquiring, analyzing, sharing and exploiting it before and better than the competition. Some proposals how to improve the acquring, analyzing and sharing of the information can be found from the literature. E.g., Thelwall has stated, that commercial search engines and subject gateways are the two most important methods for finding web-based information (Thelwall, 2000).

Business Technology Portals Case Description

This chapter presents the overview of the Business Technology Portals case description. It contains information on the BTP (Business Technology Portals) development project, and the developed framework for sharing strategic information. These are presented to give a description of the environment in which the Internet based tools and methods for sharing and acquiring the competitive environment knowledge were constructed and deployed.

BTP Development Project

The main goal of the BTP Development Project was to develop advanced methods and tools to acquire and to share strategic knowledge of the competitive environment using Business Technology Portals (BTPs). The project was funded by the technology management of the ABB through the corporate research programs, and it was initiated on its request to develop better methods and tools that support scanning of the competitive environment. The project started up with a technology-orientated prestudy, in which the possible technologies that could be used for the purpose were reviewed and analyzed. As a result, the LN based intranet with Verity full-text search engine was selected because of the existing infrastructures containing servers and databases around the world, and because some additional existing services like user administration and information security issues. Consequently, the development and the customization of the portals

would be fast and flexible, and it could be carried out within the available budget. However, the selection was difficult, since it also meant compromises on the user interface and lack of certain advanced technical features available with the other possible technologies.

The actual deployment started with three pilot portals, including two portals deployed in two business units, and one Demo portal for marketing purposes. Ideas and specifications for the functionality were developed in cooperation with pilot users, as well as testing of the new functionality. The two pilot deployments and the demo portal were used to enable fast feedback for the project team and to validate the usefulness and the usability of the developed methods and tools. The project continued by deploying more portals in different units within ABB, altogether 10 portals were deployed.

Business Technology Portals

Business Technology Portals are knowledge acquisition and sharing portals, providing single point of access to all relevant information for a certain business. Portal contains

- information, typically summaries and analysis, written by different experts, with the help of questions guiding to consider similar issues and to use standard form in documenting the knowledge
- information provided and filtered automatically by the full-text search engine, e.g., from news services
- advanced customized tools that can be used to acquire more information, e.g., from competition pages
- links to other relevant information sources, picked by the experts (method similar to hit management)

Business specific news are presented on the front page. The rest of the content in the portals has been divided into four sections, which are Customers and Market, Competitors, Technologies and Tools. Customers and Market section is further divided into subcategories, e.g., Markets Segments, Market Channels and Key Customers. Competitors are divided into subcategories like Key Competitors, Challengers and Substitute Products. Technology section is divided into subcategories like Key Technologies, Emerging Technologies and Patents. Subcategories Key Customers, Key Competitors and Challengers contain page or pages for each of the companies, presenting basic data about the company, SWOT analysis, company specific news feed, and

analysis of the competitors' products and the competitors' patent portfolio. If possible, also a list of key persons is included, e.g., experts mentioned in the patent applications or experts presenting important scientific findings in conferences. The list of key persons could be further used in searching for confidential information from the Internet by using the names as the search criteria.

In the tools section, the tools for acquiring more information were available for the users, e.g., Customer, Competitor, Technology, Article, Tender, News Storage and Patent Search Tools. The search tools are described in more details later in this article.

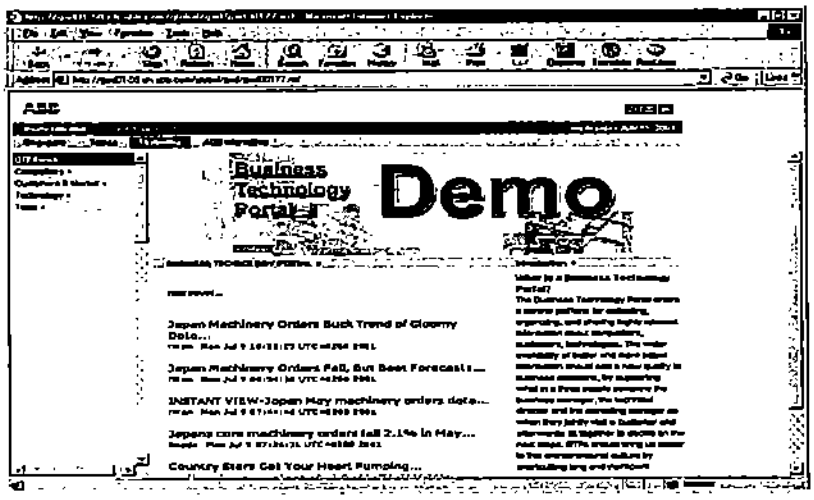

Figure 1. The front page of a Business Technology Portal.

The business technology portals were customized to provide information relevant for the business unit, using the capabilities of modern full-text search technology and some other more simple methods. The customizations were based on, in the first phase, the names of the competitors, names of the main customers, and names and short descriptions of the key technologies of the unit. In addition, a patent search profile was built to filter information related the latest patent applications.

Framework for Acquiring and Sharing Strategic Knowledge

It was earlier proposed that experts (e.g. librarians, information experts, industry experts, customers, manufacturers, sales force, dealers etc.) should be involved in scanning and they should be part of the networks of the managers to guarantee successful transfer of this expertise.

In general, experts scan the environment mainly based on judgments, insights and tacit knowledge (Roussel, Saad and Erickson, 1991, Pirttilä, 2000). However, experts cannot usually predict the future any better than other people can, although they often believe they can (Starbuck, 1992). Therefore, experts need to have advanced tools utilizing information technology in order to have correct information for their predictions.

This article concentrates on clarifying how to improve the scanning, by utilizing other people and by information technology, especially modern advanced full-text search technology and automatic searches.

Strategic Knowledge Cycle

This article proposes that systematic competitive environment scanning for strategic decision making purpose should be done in complementary parts of the same process similar to the Expertise Cycle, which is used for explaining how expertise is acquired and shared. Expertise Cycle, and its theoretical basis, including Nonakas Knowledge Spiral, has been described by the author earlier (Karhu, 2002). The phases are connected by experts belonging to an informal network of managers. See Figure 2. The main difference of Strategic Information Cycle compared to Expertise Cycle, is the use of discussions with the informal networks along the explicit information for acquisition of strategic knowledge

The Strategic Knowledge Cycle also resembles the framework provided by Pirttilä, however it adds the steps in which the scanning is done, based on the knowledge management approach, and it adds the experts performing those steps. (Pirttilä, 2000)

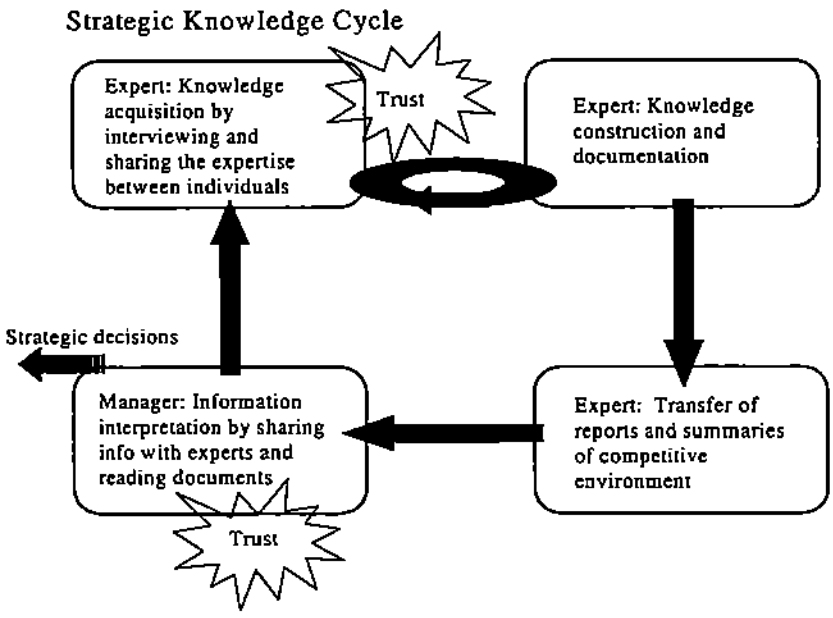

Figure 2. Strategic Information Cycle presenting how strategic knowledge is acquired, constructed and transferred.

The phases of Strategic Information Cycle are:

- Knowledge acquisition: Experts screen the environment systematically, using advanced tools, interviews and knowledge sharing between people. They learn by using given methods and tools, their personal creativity and learning skills.
- Knowledge construction: Experts analyze, summarize and document the knowledge they have constructed based on the knowledge acquisition phase.
- Information distribution and interpretation: Explicit knowledge in the form of documents is published, transferred and shared.
- Managers acquire knowledge about the competitive environment by discussing with their informal networks and reading documents. Trust and other relational dimensions of relationships are important for managers to receive the correct information. Therefore,

experts should be part of the informal networks of managers in order to be used as sources of strategic information.

Environment and Background of the Case

As technology strategy is reviewed in ABB yearly/biyearly for strategic technology planning purposes, technology review meetings are arranged for the purpose. The goal of the technology review meetings is to discuss and to decide on the strategic directions into which the business units should direct their technology investments. To meet the goal, it was important to first establish proper knowledge of the competitive environment, based on scanning the competitive environment prior to the meeting. The knowledge of the competitive environment was acquired by technology managers of the group with the help of experts from corporate research, trying to challenge and direct the managers of the business units to think of the future and available options more thoroughly, strategically and innovatively. The experts from corporate research were given the task to scan the competitive environment and to recognize the most important trends that could affect the business unit.

The findings were based on the internal interviews of other experts within the company and externally, e.g. people at fairs and seminars. In addition, business technology portals were built to help the experts to scan the competitive environment using the available competitive intelligence tools from the portal, and to share the analyses and the summaries written by the experts. The business technology portals were customized to provide information on the business unit, using the capabilities of modern full-text search technology and some other more simple methods. In addition, a patent search profile was built to push information related to the latest patent applications.

Besides the patent applications, other internet sources were used as well, as the information source for the competitive intelligence tools, e.g. news portals and company internet pages, as well as scientific publications and information provided by different associations. These information sources were selected based on careful evaluation and analysis. The expert selected the sources for technical information, to assure the good quality of the content. However, search engines were used to find more information sources that were similar to the ones that the expert picked, since it was assumed that even experts are not aware of all the best information sources.

As described, experts used the business technology portals and tools within them as the source of competitive environment information when scanning the environment. In addition, the experts used the portals to document their knowledge, e.g. writing summaries of different competitors, concentrating to explain the important changes and how they could be capable of threatening the position of the business unit. This information was then usable, besides for the technology managers, for other experts and information seekers within ABB. Besides, the documented findings in the portal, the experts shared their expertise of the topic with the managers making the important strategic decisions, participating also to the Technology Review meetings.

Developed Methods and Tools

The rest of this article discusses the developed methods to improve scanning utilizing modern advanced full-text search technology and automatic searches. The quality of the search results depends very much on the quality of the information sources to be searched. In addition, the methods to be utilized by the search engines needs to be adjusted to the selected information source. For more information on how to improve the information quality by using certain search method, please refer to an article published by the author earlier. (Gelle and Karhu, 2003)

As stated in the literature, current search engines have significant weaknesses, e.g. it is difficult to construct search queries, to arrange results and to isolate specific types of documents. This study promotes the importance of customized search engines, as means to provide good quality information and ease the difficulties users have searching for it. Since technology is considered as one of the leading drives for strategic changes, this article proposes and explains usage of information sources that can be used to scan technologies. Information to be utilized should have high quality, which is recent, relevant and reliable information. The following information sources are used:

- News: News providers, e.g. Reuters, offer their quality news in the Internet, and some sources offer categorized news combined from several news sources.
- Company Internet Pages: Competitors offer a lot of information about their products and activities in their Internet pages.
- Patents: Patent information is available in the Internet. Analyzing the patent information can hint what the competitors are planning to do in the future.

- Other Internet Sites

News

News providers, e.g. Reuters, offer their own news and some providers offer categorized news combined from several news providers, e.g., industry news category, which contains subsections for utilities and chemical industry. News is provided daily, often updated several times a day - therefore news is recent information. News is provided by companies known for high quality news for newspapers and the same information is in the Internet; therefore the Internet news are reliable information. Relevancy of this information depends on the context; e.g., each business is interested in the competitor news of a specific business.

Therefore, it is concluded that quality of the Internet news is good and they can be used for scanning the competitive environment. Usage of news and tools that support the competitive environment scanning are described next.

Daily news is presented to a user via portal pages in the Intranet, according to information categorization structure. Daily business news is presented on the front page, where users can see the overall picture of the new issues in their business area when entering to the portal. Daily business news is built by utilizing the existing categories of news providers, presenting headlines and links on the portal page. Since more than ten pieces of news typically appear for each specified business field daily, only links to the latest pieces are presented. Therefore, only the most recent news can be found by observing the front page.

All key competitors as well as key customers have their own page or pages in the portal, containing company specific daily news, along with other information that is collected. The company news cover either the entire competitor or only its certain part e.g. business division. Siemens, for example, is working in several business areas and hence an ABB business unit competing in utility business might want to scan Siemens news only in the Utility news.

Scanning the technologies through the news is more difficult. The following obstacles have been found:

- Key words that describe the key technology well are difficult to choose.

- Normal news providers, e.g. Reuters, do not present most of the technical breakthroughs. More sophisticated news providers are to be used for presenting the technology news.

Daily news was the first step to scan the competitive environment through the news. Since only the latest news was presented in the portal, afterwards they were lost; **news storage** was needed.

Current solution is to download news from a news portal, which presents news from various sources and categorizes them. The news are downloaded daily from specified categories and put into a database where they are stored. Since only text without pictures is stored, the news archive does not require much space in the server. The search tool arranges news in the order of relevance or recentness. Users are able to limit their searches to a specific period as well. The search results are presented with a title and automatically generated short summary, containing a link to the entire text.

Daily news and news storage enabled users to scan the competitive environment daily and search for specific information from the news archive. Since users often want to focus their attention to a certain competitor or customer, an automatic **news categorization** feature was created. In most cases, competitors were already categorized to different competitor types, e.g. key competitors, challengers and start-up companies or to competitors in engineering or services. The news were first divided into these classes and furthermore to competitor subclasses. This enabled users to view the news through the tree structure and to search for pieces of news within a certain category or subcategory. In addition, special categories can be included, e.g. acquisitions or patents, to scan the latest important technology news. News categorization enables a better way to scan the competitors through news.

News can be categorized according to certain competitors or periods. Based on this structure, users are able to receive a **news notification** of the latest news, e.g. weekly news summaries of all the customers or competitors that they are interested. Sending a notification activates the users to scan the competitive environment.

Company Internet Pages

Competitors and customers offer much information about their products and activities on their Internet pages. Therefore, we should find better ways to utilize this information.

Competitor Search Tools

To utilize information on the company Internet pages, we developed search tools that search competitors or customers Internet pages, by restricting the search space to company domain or even to a small section of it. Each search tool contains a set of companies that can be searched at the same time or separately, e.g. searching for information on a certain technology or customer from the Internet pages of a competitor. Building a separate search tool for this purpose is important for two reasons:

a) Since many companies manipulate the search engines that are in their Internet pages by giving higher priority to information that they want to show, e.g. press releases, we can have more objective search results by building our own search tools.

b) By searching for the same issue from several competitors at the same time, we enable users to find the results needed fast, therefore saving time and money.

Competitor or Customer Search Tools can be implemented by building an own interface to search tools, which are available free in the Internet, or by indexing the competitor sites with own search engine.

Scanning Changes in Competitor Pages

Scanning changes in the competitor pages is easy if the competitor sites are indexed. Indexing the sites daily enables comparing the indexes between two days, and therefore indicating the changes that has been made. However, according to our experiences following the changes in the web pages does not interest many people, as mostly the scanning is not done very regularly. Although competitor pages often offer valuable information on competitors, the pages also offer much information that is not relevant. For example, company like ABB updates its Internet pages several times a day and reading all the changed documents would require a lot of work.

Financial Reports

Since most of the information provided in the company pages is not typically interesting for competitive environment scanning, we selected to scan financial reports from the indexed company pages. Financial reports were searched, e.g. annual and quarterly reports, and we

presented in the portal on the competitor pages. Since financial reports are typically named alike, they are easy to recognize with the search engine.

Patents

Not all the information on competitors' future actions can be found on their Internet pages; at least some part of the future directions is typically kept a secret. Therefore, we utilize the information in the patent databases that could reveal what the competitors' secret strategic plans are. Patents and the trails of competitive intelligence they leave concerning the corporate strategy are discussed by Rivette and Kline (Rivette and Kline, 2000) and Steele (1989).

Patent Search Tools

With patent search tools available in the Internet, the patent applications and granted patents can be searched. By searching with competitor names or by combining key words and competitor names, the correct patents can be found from the patent archives.

Patent Scanning

The patent search tools available in the Internet only provide access to information when the user is actively searching for it, and even then, it might be difficult to find all relevant patents. Therefore, we wanted to build a better method to find all relevant patents related to a certain key technology and more actively scan the new patents and patent applications. Patents are currently monitored with this tool, enabling users to view all patent applications or granted patents, or patents that have been published during a certain period, e.g. weekly.

The patents are downloaded from a commercial Internet service and inserted into a well-structured database. For scanning patents, a patent scanning profile is created with a patent attorney or patent officer, and afterwards this profile is used to dynamically present the information from a database. This information can be viewed according to certain predefined analyses, e.g. companies, or subcategories of technologies. Each view enables users to go deeper into the information structure, finally presenting the full patent.

Patent Notification

Notifications of new patents in a certain key technology can be sent to registered users weekly, to assure that the patents are monitored periodically,

Technology Search Tool

Scanning technology trends is difficult to automate; often no one prominent source of information for a given technology exits. Information on a technology is rather scattered in individual pages published by researchers, universities, or research organizations. Therefore, the first step is to manually search the Internet to find relevant Internet pages. After identifying the correct sources, they can be linked into the portal and a search tool using those sources as search space can be built.

Topics for Future Research

This article has discussed different kind of information that can be used for competitive environment scanning. It has also described tools and methods, which can be implemented to scan the environment. Some other ideas how to scan semi-automatically were created and preliminarily tested, however due to the lack of time and money, they were not considered thoroughly.
Examples of such ideas:

- Cooperation between competitors should be recognized and this information should be used to foresee possible acquisitions. Therefore, by using the list of key competitors, we can search all possible combinations of these competitors. This search can be automated and performed e.g. monthly.
- Close competitor and customer cooperation can be an indication that acquisition is ahead. Companies that often work together could be recognized. Therefore, all customer and competitor combinations could be automatically searched and analyzed, e.g. monthly or quarterly.
- If we are able to recognize the key persons of a certain competitor, e.g. from conferences or patents, information that they publish can also be searched from the Internet and used for further analyses. Searching this information should be done automatically, e.g. monthly or quarterly.

The automatic search results could be attached to the portal pages automatically, and notification of new results could be sent to some users. As these ideas were not tested thoroughly, they remain as a topic for future research. Another very appealing research topic for the future research would be investigate and to measure how much usage of Internet and modern full-text search engines, is able to improve acquiring the knowledge of the competitive environment.

Greatest possibilities to enhance scanning the competitive environment seem to come from combining computers and humans into the same information processing system, while utilizing the strengths of computers in processing the information and the human intelligence in deciding which changes, trends and signals are significant. Human capabilities are needed in analyzing and synthesizing the information to become knowledge and to share the created tacit knowledge with decision makers. Even though some good methods to combine the strengths of humans and computers to improve acquiring and sharing the strategic knowledge were found, other similar tools could be built and used as well. Finding, investigating and deploying such tools would be a good topic for future research.

Applicability of the construction for acquiring and sharing other kind of strategic knowledge should be further investigated as well.

Summary

Too often companies neglect to scan their competitive environment continuously, although adjusting their company to its competitive environment is one of the main tasks in strategic planning. Therefore, they make strategic decisions without proper information. The speed in which the market and technologies change is constantly increasing thus continuous and systematic scanning becomes extremely important. A typical manager makes decisions based on information received from their networks. Therefore, better methods and tools that help their networks to scan the competitive environment are needed.

This article has presented news, company Internet pages and patent information as information sources that are available in the Internet and can be used to scan the competitive environment. It has also presented methods and tools that can be used to automate and simplify collecting information on competitors. By utilizing the tools, time can be saved for more dedicate analyses and conclusions on the competitive environment changes.

News can be utilized by showing them to a user daily, storing them, building search tools and by categorizing. In addition, weekly and monthly notifications can be implemented. Company Internet pages containing useful information can be utilized by building search tools, by scanning changes or by automatically linking to financial reports. Patent information can be used either through Internet patent search tools or through a patent scanning application, which enables users to view only the patents that are relevant for their key technologies.

Based on the experiences of the described methods, their usage is highly recommended. These methods will reduce the time spend on information collection and enabling to spend time analyzing and constructing the knowledge. However, methods do not remove the need to spend time on scanning the competitive environment – if there is no time available, even the most advanced information collection and analysis tools cannot help.

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VITAE

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Information quality for strategic technology planning

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Keywords
Information management, Quality, Full text retrieval, Search engines

Abstract
This article discusses the increasing importance of information to so called information factories. As information management is their core competence, development of information quality should be the key focus of quality management. Good quality information is error free and fulfills the user's needs. Technology managers define their needs as having recent, relevant, reliable and analyzed information on competitive environment and development of technologies. Several methods used with full text search engines to improve different aspects of information quality, are demonstrated and described based on our constructive work, implementing Business Technology portals. Relevancy of information was improved with several used methods and reliability by structured searches with meta-information and by reduced information space. Recentness of information was improved with push technology. As conclusion, full-text search engines increase the information quality by filtering information, however recentness of information and analyzed information are more difficult aspects to improve than relevancy and reliability.

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Introduction

We are living in a knowledge society with knowledge workers and information factories, who receive input from external information sources, analyze and manage information, and create new knowledge. They give out information as output to external world, producing information products. Therefore, information quality is a critical success factor of companies and managing information is their core competence.

Managers today are facing an information overflow, consequently they have too much information available, however on the other hand, they lack recent, relevant and reliable information. Companies often neglect to screen their competitive environment, even though, information on competitors and key technologies is relevant to managers. Due to defective strategic planning systems and "infostress", managers are at a risk of non-optimal business decisions. To solve the problem, we need to prevent unnecessary irritants, enabling that essential information can be well managed. As organizations, we need to find better methods to manage information, e.g. limiting the amount of information and providing only quality, information.

Although there have been discussions on data quality, the information quality has been neglected most of the time. In addition, there is no sufficient understanding on how the information and data quality can be improved in practice. The goal of this article is to show examples on how information technology and especially full-text search engines can improve information quality by filtering information. This is shown by using Business Technology Portals as an example. Business Technology Portals manage information for technology strategy planning. Along the information structure that is used to store information, they provide advanced tools and methods that improve information quality. One of these advanced methods is full-text search, its functionality is discussed here.

Information quality in strategic technology planning

According to quality management literature, good product quality means that the product fulfills its requirements. This view is presented by the ISO 9000 and is the basis of, so called, quality control and quality assurance view. Recent quality management literature has a broader view to define quality, which considers customer focus and customer satisfaction as an essential part of quality. Therefore, besides conforming to its requirements, good quality product fulfills customer needs (Juran, 1998). In the beginning of quality management discipline, the concept of quality was applied only to products, however now discussions include quality of services and data. Some modern views of total quality management (TQM) even call for satisfaction of stakeholders and the entire society.

Different strategies and tools, e.g. quality control, quality awards, and statistical methods like six Sigma and ISO 9000 standards, can be used for implementing TQM ideas. Both TQM philosophy and TQM tools have positive impact on business performance (Huarng and Chen, 2002). However, the success factor is to recognize and develop core competencies of a business. Core competence is a capability to produce added value to the customer by combining existing resources and knowledge that has been growing in the company (Hammer,

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2001). This capability to produce added value makes product or service imitations difficult to competitors. Since modern companies are information factories, their key competence is information management. Therefore developing information management skills and information quality is essential to their business.

As discussed, fulfilling customer needs is the key character of good quality product. However, because technologies and markets are changing so fast, also customer expectations are changing constantly. Since the target is moving and since the customer expectations have to be fulfilled every time, continuous improvement of information management is needed. According to TQM, organizations need to improve their processes and quality using specific methods and tools as part of their daily work. Besides traditional quality management tools, tools that the users can use in their daily lives to improve the quality of information should be provided. Quality management has always been known, besides management philosophy, for its set of methods and tools. Therefore, providing better tools to manage information in organizations is an essential part of quality management in information factories.

Based on the presented quality management view, to provide good quality information for planning the technology strategy, we need to:

- define the user needs (their current problems);
- plan and specify how information technology helps to fulfill customer needs;
- implement methods and tools that conform to specifications;
- check how implementation fulfills customer needs;
- plan how data quality can continuously be improved;
- implement small improvements.

This is the framework used here to develop data quality. The first three steps are seen as reengineering, inventing totally new ways, rules and methods, whereas the last three steps are seen as continuous improvement, proceeding with small steps, correcting and developing existing rules and methods. Development typically consists of these two forms of development (Lillrank, 1990).

In this article, we mainly have the focus in re-engineering, by describing new methods to improve information quality. However, the tools and methods that have been developed are to be used in the continuous improvement of information quality within a company. We start by observing current problems and challenges in strategy planning systems. Developing strategy planning systems is important not only because of the importance of the strategic decision making to the company's success but also because managers are usually the last group of users to receive computer support.

Defining the needs

The modern view of quality consists of conformance to requirements (free of error) and the fulfillment of customer needs (quality of requirements and design). Data quality has been defined similarly as freedom of defects, such as inaccessibility, inaccuracy, out-of-date information, inconsistencies, incomplete and incomprehensive information, and possessing desirable characteristics, e.g. timeliness, truthfulness, intelligibility and significance. In addition, other definitions of data quality exist, e.g. data quality consists of data model and value quality, and data presentation quality (Loshin, 2001). In this article, we follow the modern view of quality. Therefore we start the article by defining information management needs among our customers, the technology managers. This is especially important since understanding clearly information requirements has been one of the main challenges for developing computer support for managers (Basu *et al.*, 2000).

Symptoms of information flood

The availability of too much information as well as fast changing markets and technology is flooding us with information. This phenomenon has several names, info smog being one of them (Applehans *et al.*, 1999). Consequently we are receiving too much scattered, unreliable, obsolete information coming from distributed sources. These symptoms are described here in detail.

There simply is too much information available – every day people feel frustrated trying to handle all the information they receive. Examples are not hard to find: all the messages we find daily in our mail boxes, the daily appearance of 20 million new Web pages or the amount of information in other media. Even with this tremendous amount of information we have, people still feel that they are missing important information. Over-supply of information leads to decreasing value of information, to stress and saturation (Marien, 1999).

Information is also becoming more global than ever – following the development of markets and technology, near us is not good

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enough. Since we need to pay attention to the entire world, scattered information is received from distributed sources. According to Brown and Duguid (2000) knowledge workers are also frightened of getting tunnel vision, because the information is often transferred in small pieces, without setting the information into larger context. People evaluate the reliability of information by relating it to a person who is the source of information. If the information we receive is lacking social context, it is difficult to trust the information (Brown and Duguid, 2000; Davenport and Beck, 2001).

The speed in which technology and science constantly develops is increasing exponentially, producing more and more information every day, e.g. 90 percent of researchers who have ever existed are living now (Nordström and Ridderstrale, 1999). Since markets and technologies change fast, information that is relevant and recent today becomes obsolete fast.

Davenport and Beck present the symptoms on organizational level as an increased likelihood of missing key information when making decisions, diminished time for reflection, difficulty in holding others' attention and decreased ability to focus (Davenport and Beck, 2001). Therefore, we can conclude that organizations, as well as individuals, suffer from infostress.

The ideas presented here are in line with the needs presented to us by some senior technology managers; they expressed their need of "recent, relevant and reliable" information. Recent and reliable information are generic characters of information, but relevancy depends on the context. Information is relevant if users are delivered information they need and prefer. Non-relevant information annoys users and makes it impossible to locate relevant bits and pieces. Therefore, we proceed by describing technology strategy planning and especially the kind of information that is relevant to it.

Strategic technology planning

Strategy is a unifying idea that links functional areas and company's activities to its competitive environment. Strategic planning system is a structured process that organizes and coordinates the activities of managers, who plan the strategy. It has two major functions:

1. developing an integrated, coordinated and consistent long-term plan of action;
2. facilitating the adaptation of a corporation to an environmental change (Lorange and Vancil, 1976).

However, it is quite common that companies concentrate on the integrated and coordinated aspects of strategy planning, forgetting to screen the competitive environment that they need to adjust (Lorange and Vancil, 1976; Montgomery and Porter, 1991). Often the focus is on an approach that consists of aggregating transactional information in ERP systems into business reports that would allow managers to forecast and do strategic planning. Rather, the company should identify and actively screen its key competitors and technology areas. Screening the technical changes is another often-neglected issue in the strategy planning system since managers who master both technical and business aspects are rare, however, managers and companies need to manage and pay attention to technical and economical considerations simultaneously (Kantrow, 1980).

To master a technology strategy, an organization needs to recognize its key technologies, master them and furthermore use them properly to beat competition. An organization needs to screen its environment constantly, in order to find its technical competitive position. Mostly screening is based on good technology judgment and insight (Roussel *et al.*, 1991). On the other hand, experts usually cannot predict the future any better than others, although they often believe they can (Starbuck, 1996). Therefore, it is important to develop tools that provide good quality information for strategic technology planning that can be used by experts to update their existing knowledge.

As a conclusion, in strategy planning systems, screening competitive environment and key technologies are often neglected, as well as evaluating the strengths of competitors in key technologies. If this information is lacking in technology strategy planning, the cost of poor quality is non-optimal strategic decisions that are made. This is similar to the experience made when implementing costly ERP systems and neglecting data quality therein (Vosburg and Kumar, 2001). In addition, infostress and handling too much irrelevant information creates additional cost that is caused by poor information quality.

Enhancing information quality for strategic technology planning

We have seen that it no longer is good enough to give employees powerful software tools, e.g. intranets and e-mail, instead we need to find

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methods and tools that help us to survive infostress (Applehans *et al.*, 1999). Findings from a case study (presented in Hedelin and Allwood, 2002) show that managers expect Information Technology to support better information retrieval and information integration and make available external information in a more consistent and integrated way. Kerr (1996) presented that for individuals, the most important skills to manage information flood are:

- ability to find information that fulfills our needs;
- ability to choose the most essential part of information;
- ability to analyze and synthesize collected information.

These skills, prioritize, synthesize and find available information, are also required to manage infostress in organizations. When companies draft their strategy they really ask; to what questions they allocate management attention, all aspects of the competitive environment cannot be scanned or analyzed (Davenport and Beck, 2001). Since tools should help us manage information well, these should also be functions of the advanced tools for information management.

How can information technology help?

To provide good quality information, we would need to find relevant information, choose the most essential parts and synthesize collected information. See Figure 1, where this workflow is presented.

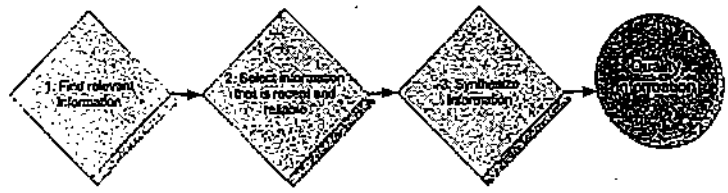
Next, we consider how information technology could be used to help in this process.

1 Advanced full-text search engines can be used to find relevant information, based on key words or information categories. The information can be searched from internal sources, e.g. LN databases or intranet portals or from external sources, e.g. WWW.
2 Advanced search engines can also be used to choose information that is reliable and actual, although this is more difficult. To implement functions that choose information based on these concepts, the functions have to be defined.
   - Reliable information is information that is true. Since trueness of a piece of information is difficult to know or test, information coming from a trustworthy source is considered a true information feature. Another character is that information is consistent, meaning that it complements another piece of information, though information is delivered from several sources. Trustworthy sites are recognizable by the fact that the author's name is provided as meta-data creation and modification dates are also given. Trustworthiness depends on how known the author is in the area for which he is providing information.
   - Recent information, here, means the same as timeliness of information. In other words, information that is delivered as quickly as possible to the consumer and out-dated information is removed from consumer's attention. Since the amount of information available in electronic format grows daily and as it is no longer possible to digest it manually, automatic content delivery becomes important in this context.
3 Analyzing and synthesizing information is a demanding task that might be impossible to implement with information technologies. However, summarization of information can help to accomplish this task.

Methods for information quality support

To support the workflow described in Figure 1, we implemented Business Technology Portals (BTP), which support technology management within a business

Figure 1
Process for providing quality information



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unit. Business Technology Portals provide a single point of access to information relevant in technology management. They make available authored information and information pushed from the Internet, as well as advanced tools that assist users in finding relevant information. We shortly explain the functions realized by the Portals. Then, we mainly concentrate on how information technology can provide methods and techniques to improve information quality.

Conceptual view: the information pyramid

In order to provide meaningful, relevant, recent, and reliable information, we rely on a set of techniques and methods shown in the information pyramid (Figure 2). It represents methods that become increasingly complex towards the top as they are attempting to simulate the human capacity of synthesizing information.

The bottom layer, called integration layer, is responsible for integrating information into a portal coming from different sources, such as the World Wide Web, internal databases, and information systems.

In the maintenance layer, means for collecting, storing, accessing, maintaining, and archiving information are provided. Each piece of information is annotated with some meta-data such as the author name, the name of the data source it originates from, the creation and modification date etc.

The filtering layer provides tools for searching, personalizing, and notification, i.e. pushing information to users based on profiles.

The analysis layer makes use of intelligent tools to classify and summarize information, to learn from existing data in order to forecast and optimize.

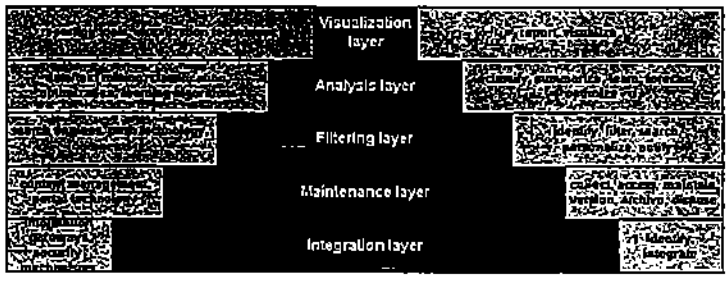
In the representation layer, the aggregated information is finally shown to users. In this layer, it is important to choose a convincing way to visualize information.

Existing technologies and current limitations

The integration and maintenance layer provide the basic functionality without which a portal cannot be implemented. These layers make sure that information creation, the basic handling, and disposal is available. The intelligent handling of information is a function belonging to the layers of filtering, analysis, and visualization. Examples of important technologies in the filtering layer are search engines, agent and push technology.

Most search engines currently available in the Internet implement full-text search (see Table I). Full text search allows users to retrieve documents, in which given keywords appear, from an information source mainly consisting of text documents. A full-text search engine is thus a remotely accessible program that takes as input a query composed of keywords and searches previously indicated information sources for these keywords. The resulting pages of a specific search are listed according to ranking criteria such as the relevance and the precision of the result. Some typical measures for relevance and precision are, for example, the frequency of keyword occurrence, the age of the reference document, the distribution of keywords in a page, the access rate of this page etc. Some search engines augment frequency-based measures of the result with quality-based filtering. This means that ranking of search results does not only depend on the number of keyword occurrences in a document but also includes some notion of "quality" of the Web site. A high quality Web site is described in Henzinger (2001) as one which is referenced by a large number of other sites

Figure 2
Information pyramid showing methods increasing in intelligent behavior to the right of the pyramid. Examples of technologies implementing these methods are shown on the left



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(Google). Another measure of quality is the amount of time that users spent perusing a site (Direct hit). The choice of keywords and the context in which they are used also influences the search results (Brewer 2001). Very generic keywords lead to hundreds of hits whereas a specific word might result in no result (Baeza-Yates and Ribeiro-Neto, 1999).

A search engine is implemented via an index similar to a book index. Web crawlers use the link structure of the Web to generate this index automatically. Nowadays, a crawler requires several days to index a large portion of the Web. Consequently, some of the links may already be out of date when they are accessed by a search query. In addition, only up to 40 percent of all information on the Web is indexed and these indexes reside on huge servers, which are accessed by search engines. Newer approaches prefer a distributed set of search repositories with the drawback that availability of the whole can no longer be guaranteed (Brewer, 2001).

In addition to search, agent and push technology can be combined to deliver some service in a portal. An agent is a software entity that provides a service independent from any user interaction. It does not have a fixed algorithm but a set of behavior patterns with which it reacts and gathers information from the environment. An agent can, for example, build a topic specific index by scanning through the Web in order to gather information according to specific user preferences (Rőse and Huhns, 2000; O'Meara and Patel, 2001). Push technology can then be used in order to inform a user via notification when some information source has changed.

Examples of techniques in the analysis layer are text and data mining, learning, and classification algorithms. They provide the technology for identifying valid, understandable, and potentially useful patterns from large sets of data that have to be interpreted in the context of a business goal (Michalski *et al.* 1998). Similarly, visualization techniques present data in some visual form and thus allow the user to build hypotheses and draw conclusions and to act on them (Keim, 2001).

Table I
Strengths and weaknesses of full text search

Strength	Weakness
Search over a vast amount of information	Only documents containing the keyword are retrieved
Fast once the index has been created	Only 40 percent of the WWW is indexed currently
	Only textual information is searched, for multimedia documents feature spaces have to be defined first
No knowledge of the Web document structure is necessary	Difficult to capture contextual information in keywords

Full-text search: how to improve quality of results

In this section, we show how quality of information is improved by implementing a search engine on top of the maintenance layer shown in Figure 1. As discussed in the previous section, full-text search suffers from various shortcomings such as a huge result list, ambiguous use of search keywords, and with the Web an unstructured information space uncontrollably increasing in size. According to quality criteria of information – reliable, recent, and relevant the following actions should be taken to improve full-text search.

- Reduce the information space, e.g. the amount of documents or pages on the Web. Regarding search on the Internet, this amounts to restricting search to a specific domain. Reducing the search space not only improves the quality of information. Also the reliability of resulting information can be assessed more thoroughly by evaluating the trustworthiness of the site itself.
- Increase the quality of search keywords in order to provide a good context for searching. A more elaborate technique consists in refining the search keywords iteratively. The initial set of keywords is improved by learning from previous search results. Boolean queries can be used to specify a particular context as they allow the combination of keywords with operators like AND, OR, NOT. For example, if we type keyword "atom" in Google, approximately 900,000 Web pages are found. If we want to find out more about the concept of atom as a small unit out of which molecules are built, we refine the keywords into "atom and molecule" (137,000 pages). Sometimes it can be useful to describe a concept by synonyms and very specific words.
- Improve the ranking of the resulting hit list of a search engine by adding additional context-sensitive criteria. Most search engines allow users to refine an existing search by adding keywords. However, this refinement consists of repeating the extended query on the initial set of documents. A new mechanism is needed for directly

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searching a result list produced by an earlier search.
- Apply a structure to pages and documents to be searched in order to transform previously non-structured search space into a semi-structured[1] one. This can be achieved by augmenting the existing information with meta-information on title, author, creation and modification date, original source, keywords, abstract etc. The reliability of a source can be confirmed more easily when an author field is available and the relevancy can be increased through searching specific fields.
- Use full-text search together with an established categorization of the information space in order to improve search results. Some search engines, e.g. Yahoo or Google, provide topics (sometimes also called categories) arranged in hierarchies. Web sites are categorized using these topics. This makes it possible to search information on a specific topic. If we want to know for example how atoms can be visualized using multimedia, we can click on the link to Google directory Science – Education – Chemistry – Multimedia. In this category, we can search only those pages that have been classified under this topic. The search for "atom and molecule" results in a hit list of 6 pages out of 28.
- Use patterns instead of simple keywords. Pattern matching allows for searching substrings or patterns in input data, usually applying some kind of regular expression. It can define the neighborhood of words, a specific sequence of words, or express only the root of a word.

Results and experiences

We have implemented some of the improved search strategies mentioned in the previous section in our Business Technology Portal (BTP). They are explained in the following.

Competitor search

In order to improve competitor screening, we provide a set of predefined categories such as key competitors, challengers, or start-ups. Within these categories, each competitor has its portal page. Therein existing knowledge and analyzes about the specific competitor is compiled. In addition, links to the competitor's home page can be inserted.

Using a freely available search engine, an interface is implemented that allows users to search each of the competitors' Web sites individually. The first time employees used our competitor search tool, they found that one of their competitors was publishing wrong information on one of their products. Consequently, they informed the competitor to remove this misleading information from the Web.

Using our own competitor search tool in contrast to using the search facility provided by the competitor Web sites has the following advantages:
- Search engines on the competitor sites provide their own ranking schemes. Results are thus no longer comparable when a search is done for several competitors. It might even happen that the ranking is influenced on purpose, e.g. presenting new offers on top of the list.
- Each search interface is different and provides different search operators. It would be a tedious work to integrate each of the search engines separately.
- Searching on the home pages of several competitors is not possible when using the competitor's search engines.

Technology watch

In order to scan developments in the technology area, businesses face a more difficult situation. There often is not one prominent source of information for a given technology on the Web. Information on a technology is rather scattered in individual Web sites of researchers, universities, and research organizations or R&D departments of companies. In this situation, the first step consists of manually searching in the Internet to provide some relevant Web sites. Once Web sites have been identified, they can either be provided by a link in the portal or the search interface can be built that is similar to the competitor search.

Another example of technology watch concerns intellectual property. We developed a patent monitoring tool, which downloads patent filings as pdf files plus a description of the patent's main information in html format. This patent information is stored in a relational database. This makes it possible to analyze patent information according to companies or technology areas or both combined (Figure 3).

Customer complaint management

We use a customer complaint management system in our company. This tool tracks the treatment of complaints issued by the customers regarding ABB products. It is linked into our portal through a simple search interface (Figure 4). The interface provides a customized search either for retrieving customer complaints for a specific customer or product.

Portal search

We built an interface for searching information in the portal using our own search engine (Figure 5). This means that an

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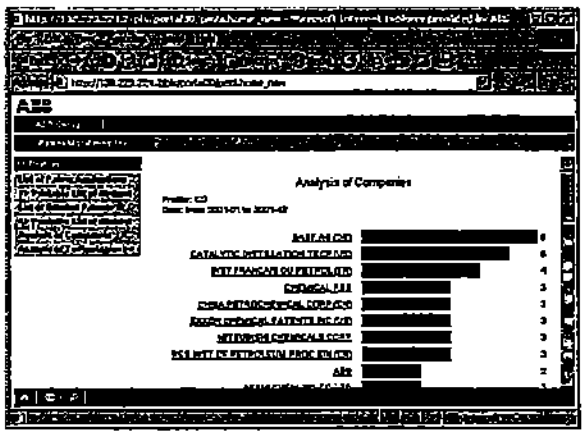
index as a basis for searching is created on our own servers. This index does not only enable us to search our own source – the portal – but it also enables us to present the latest documents added into the portal. Using incremental updates of the index, the search engine can provide information on which documents have been changed or added recently as they appear as new or modified in the index.

Filtered and classified online news

In the main page of the Business Technology Portal, online news is presented. The online news service offers an interface in Javascript through which online news is updated regularly. We customize this news by adding keywords and categories as predefined by the service. The quality of news depends on how appropriate the existing categorization is for a specific business and on how well additional keywords describe a field of interest. While it is simple to provide the gas and oil business with relevant news, it is difficult to filter relevant news for the drives business for example. One of the reasons is that drive technology is not only used in motors but also in computer hardware[2].

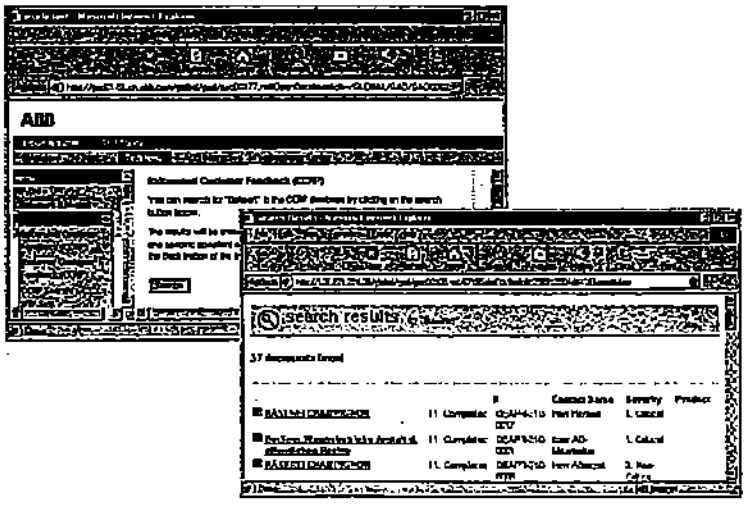
Figure 3
Analyzed information from the patent monitoring tool



Analysis of results

We have described several examples from our Business Technology Portals, where these advanced possibilities to improve full-text searches are utilized. We have recognized five different possibilities to improve the searches by an innovative approach: reducing information space; increasing keyword usage possibilities; improving ranking of search results with iterations; structured searches with meta-information and using established information categorization. The examples are

Figure 4
Linking an internal database to the portal through a search interface



presented in Table II, mentioning the methods that are used and the quality aspect of information that has been improved with the example.

From these experiences, it can be concluded that reducing information space is, in most cases, a useful method that mainly improves the relevancy of information. In addition, the reliability of information can be improved if experts in the field check the results and the search area is reduced to information sources that they have accepted. Increased keyword usage possibilities and using established information categorization enhance the relevancy of search results. Structured searches with meta-information help to find relevant information when the importance of search results is evaluated using meta-information, but just as well, they help to evaluate the reliability of information when the author etc. can be presented. Improved ranking of search results with iterations helps to find more relevant information, e.g. searching for competitors from a certain industry field. Push technology helps users by presenting recent information to them, and in combination with personalization, it helps to present relevant information also (see Table III). However, none of the methods was able to improve the achieving of analyzed information.

In addition, it can be concluded that only push technology seems to improve the timeliness of information, whereas there are more methods that can be used to achieve relevant and reliable information (see Table IV).

Conclusion

Information management is a core competence of the modern companies who act as information factories, using information as input, managing it and producing more of it. Therefore, development of information quality should be the focus of quality management. Information of good quality is information that is error free and

Figure 5
Searching the Business Technology Portal using the keyword "patent"

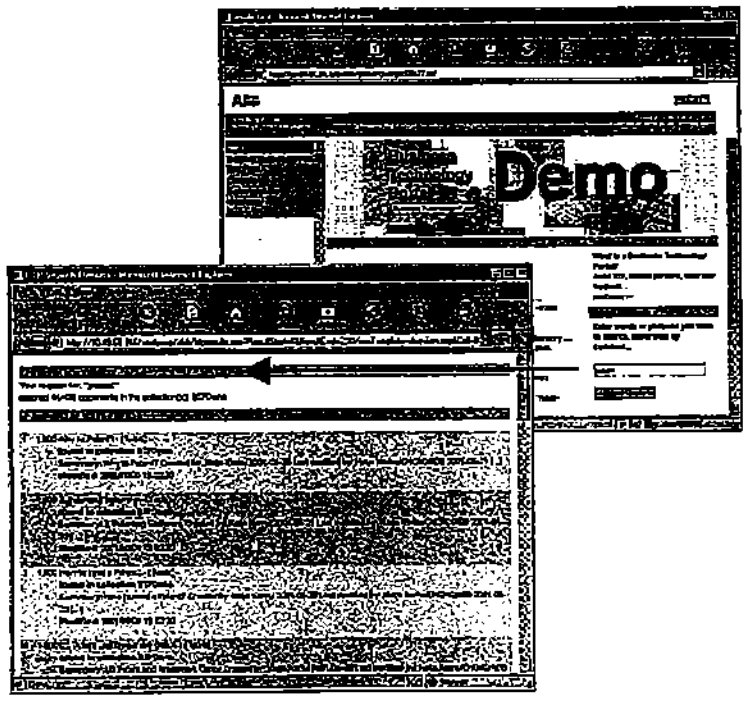


Table II
Summary of the examples, the methods used in them and the improved quality aspect

Example	Method used	Improved quality aspect
Competitor search	Reduced information space, increased keyword usage possibilities	Relevant
Technology watch	Using established information categorization, reduced information space, increased keyword usage possibilities	Relevant, reliable
Customer complaint management	Structured searches with meta-information	Relevant
Portal search	Reduced information space, increased keyword usage possibilities, using established information categorization, (push-technology)	Relevant, recent
On-line news	Reduced information space, using established information categorization, improved ranking of search results with iterations, (push technology)	Relevant, recent, reliable

Table III
Methods and improved information quality aspects

Method	Improved information quality aspect
Reduced information space	Relevant, reliable
Increased keyword usage possibilities	Relevant
Using established information categorization	Relevant
Structured searches with meta-information	Relevant, reliable, recent
Improved ranking of search results with iterations	Relevant
Push technology	Recent

Table IV
Improved quality aspect and the method that was used

Improved quality management aspect	Method
Recent	Push technology
Relevant	Structured searches with meta-information, using established information categorization, increased keyword usage possibilities, reduced information space, improved ranking of search results with iterations
Reliable	Structured searches with meta-information, reduced information space

fulfills the user's needs. R&D managers have defined their need as having recent, relevant and reliable information, as well as analyzed information. Therefore, we have searched for methods and tools that could improve these aspects of information.

Information quality can be increased with different methods and in different levels of the information pyramid. We have taken information filtering into further consideration, because it provides methods to protect us from getting too much information. Especially we are interested in the modern full-text search engines. However there are limitations in the current approach of full text search that we take into consideration, trying to improve the searches by an innovative approach. We have tested five different possibilities: reducing information space; increasing keyword usage possibilities; improving ranking of search results with iterations; structured searches with meta-information; and using established information categorization.

Based on the experiences, we conclude that methods used in the filtering layer can improve the information quality for strategic technology management. Many methods are available especially for improving relevancy of information. Improving the recentness and reliability of information is more difficult. Since we believe that information quality aspects we have discussed (recent, relevant, reliable and analyzed information) are generic, also the results can be generalized to other information fields.

Our work in this field has been very practical and case oriented, therefore, we recognize the need for deeper analysis in this field.

Notes

1 Semi-structured search space contains explicit fields, e.g. title, author. Within some of the fields text information needs to be searched. A semi-structure is provided by XML.

2 A drive can be a computer component (hard disk drive), it can be a road, or it can be a device which drives a motor.

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Literature Research Approach on Research topic: Scanning Competitive Environment

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Abstract

This article describes methods and tools used for scanning competitive environment, based on a literature research. As result, many conceptual descriptions of the topic were found, explaining why scanning the competitive environment is important, and categorizing scanning methods. Descriptions of specific methods were found, e.g., SWOT, QFD, expert essays and panels, Delphi, reverse engineering and literature reviews. In addition, some computer-based descriptions did exist, e.g. descriptions on agents, push technology and filters. Most of the methods can be used to improve some specific part of scanning the competitive environment. However, none of those methods fully supports the whole scanning process, and none of those methods fully supports combining humans and computers for processing the information. According to the literature, especially effective scanning process would be human-computer mixed information processing. Despite the descriptions and widely recognized importance of systematic scanning of competitive environment, most companies do not have systematic process at all. Most of the companies do not use any of the proposed methods for scanning the competitive environment.

Keywords

competitive environment, environmental scanning, business intelligence, literature

Introduction

Despite the fact, that volatility of the business environment is increasing, and accelerating changes in customer needs and technological developments are the main drivers for change in today's business environment, scanning the competitive environment is often neglected issue in strategic planning (EIRMA 2001). Besides competitors, the competitive environment consists of underlying economics and the classical competitive forces, which are bargaining power of suppliers, customers, and threat of new entrants or substitute products.

Infostress has been bothering managers lately. The infostress has been caused by the information overload and on the other hand feeling the lack of information when the essential information is drowning among unessential. Information overload is based on the amount and type of stimuli perceived by the observer. Besides quantitative overload, the overload phenomena can be brought about fuzzy, contradictory or incomprehensible supply, which are information quality problems. Especially high overload is established in strategic and qualitative matters (e.g. marketing segmentation, business environment analysis and competitor analysis). The information surplus, unused information, is called information waste.

In this article, the importance of scanning the competitive environment has been reviewed and the lack of good quality information for strategic decision-making has been recognized. Especially managers suffer from information overload, therefore the needs for scanning changes and events and the limited capacity of human attention need to balance well. Only seven percentage of information collected by the companies are further analyzed and used. Therefore, instead of providing more information, companies should concentrate on providing good quality information for the decision makers.

Based on viewing literature, descriptions of the systematic continuous scanning are rare. In addition, no good summarizations of the methods used for scanning the competitive environment were found. Therefore, this paper describes literature on scanning the competitive environment, and summarizes the methods and the tools that are used for acquiring this knowledge. The aim is

- To provide comprehensive picture of the existing scanning practices in order for companies to compare their own practices to the existing state of art
- To provide researches a baseline of existing practices in order to compare their suggestions and their constructions
- To find innovative improvement ideas and new methods for improving scanning activities, benefits practitioners and researchers in further development of environmental scanning.

Finding and systematizing knowledge is important in today's decision making. This article is about scanning competitive environment, but it is written from a meta-viewpoint, describing a deep study on the scanning activity. Therefore, while describing the concept of scanning the competitive environment, and methods and tools used for it, the article also describes how to do such a study in the modern databases.

Methodology

To find out what kind of methods are used and proposed for scanning the competitive environment, a good overview of the literature is needed. To be effective in literature research, several search strategies is used: undirected viewing, conditioned viewing, informal search and formal search. The used incremental search strategies were:

1. Before the informal and the formal searches described in this article, author has been building the knowledge of the knowledge acquisition for strategic purposes through related literature with various focuses, ending up to narrow the focus to scanning the competitive environment. The results of this undirected and directed viewing are described in the articles published earlier by the author (Karhu 2001; Karhu 2002; Gelle & Karhu 2003).

2. The informal search was started by choosing the information sources, relevant information was assured by selecting "Emerald publications" as the information source, it provides academic, good quality information with various focuses and a fulltext search engine for the internet users, with meta-information fields. The Emerald publications is an electronic marketing channel providing publications published by MCB University Press, to simplify the text, in this article its content is hereafter called as "Emerald Publications". The search criterion was built iteratively, and it was then used for formal searching.

3. In the first phase of the formal searching, all resulting articles were reviewed, and traditional and innovative methods for the information acquisition for strategic planning purposes were categorized. Concepts appearing in the relevant articles, but not typically in other articles were recognized and recorded, to further use them as search criteria in the next formal searches. As conclusion, the relevancy and the reliability were improved by structured searches with meta information, increased keyword usage and reduced information space.

4. For the second part of the formal search, Internet was used as the search space, searching with the same criteria as in the first search - however the amount of hits was tremendous and the relevancy of results poor. Next, the concept "environmental scanning" was used to search articles from the Internet, which led into a reasonable amount of results with good quality. The concept was chosen because the phrase is very seldom used in any other context. After finding relevant articles, used methods and tools were categorized. Informal and formal searches and their results are described below.

Informal Search

The informal search was carried out to develop quantitative data on amount the of articles published related to environmental scanning with different kind of focuses, e.g. related to technology strategy, to strategic planning and related to tools and methods for these purposes. The goal was also to develop the search criteria than can be used in formal search. Well developed search criteria enables to find big amount of relevant information and to reduce the amount of non-relevant articles that are included in the results and therefore read as well.

Results of Informal Search

Resulting articles in the last phases of the informal search are categorized below:

- Technology, strategy, knowledge, and management, resulted in three non-relevant articles. Example of articles belonging to this category is Thornton explaining that strategic ignorance of the managers should be managed instead of their knowledge (Thornton 1997).
- Knowledge management and strategic and planning resulted in 10 articles with five relevant articles. Example of relevant articles belonging to this category is Ryan discussing how knowledge base across the technical and social system is advocated to impact competitive position. (Ryan 1995) An example of non-relevant articles belonging to this category is Chan and Anderson discussing action learning and how it can be used for management development (Chan & Anderson 1994).
- (Tool or method) and technology and planning resulted in 30 articles with no relevant articles. Example of non-relevant article belonging to this category was Bahout explaining the importance of knowing the technology development and its influences to the social system and world economies (Bahout 1994). Another example is Michael describing various best practices that could be used for IT management in schools (Michael 1998).
- (Tool or method) and strategic and planning resulted in 37 articles with 10 relevant articles. Examples of relevant articles belonging to this category are Piercy and Giles describing five point approach to make SWOT work and Subramoniam and Krishnankutty recommending expert system to be used for choosing the correct

strategic planning method and tool. (Piercy & Giles 1989; Subramoniam & Krishnankutty 2002). Third example is Graetz discussing the differences of strategic thinking versus strategic planning, e.g. the role of emotional intelligence (Graetz 2002). Example of non-relevant articles belonging to this category is article discussing how to measure the strategic planning effectiveness using diagnostic tools developed for hotels (Phillips & Moutinho 1999).

- (Tool or method) and competitor resulted 3 not relevant articles.

The best results appeared when words strategic and planning was included, therefore, the next searches contained the words strategic and planning, and a selection of other concepts. The goal of this search was to clarify in which information space the formal search should be done (from the abstracts, and if adding R&D or product development criterias would improve the results.

- Searching from abstracts, with the criteria: "strategic planning" and (knowledge or information or expertise) and (tool or method or gathering or acquiring or colleting or screening or scanning or sharing or transferring) resulted in 19 hits with five relevant articles. Relevant articles are discussing e.g. war gaming and scenario planning used for strategic purposes (Kryt & Paliwoda 1992; McNeilly 2002). An example of non-relevant articles belonging to this category is article discussing web site management approaches (Clyde 2000).
- Searching from the whole article, the criteria "strategic planning" and (knowledge or information or expertise) and (tool or method or gathering or acquiring or colleting or screening or scanning or sharing or transferring) and competitor resulted in 250 hits. The relevancy was calculated from the first 25 abstracts with few relevant articles. Example of relevant articles belonging to this category is discussion on the current CI practices in UK companies, and example of non-relevant articles belonging to this category is Grieves focusing in organization development (Wright & Pickton & Callow 2002; Grieves 2000).
- Searching from the whole article, the criteria "strategic planning" (knowledge or information or expertise) and (tool or method or gathering or acquiring or colleting or screening or scanning or sharing or transferring) and competitor and ("product development" or R&D) resulted in 114 hits with few relevant articles. Example of a relevant article belonging to this category is Fletcher discussing about the experiences using a competitor information system, and example of non-relevant articles belonging to this category is Chako explaining on the role of inventions and innovations (Fletcher & Donaghy 1993; Chako 2000).

As the amount of resulting articles increased significantly (10 times more articles where found) when searching from the whole are article and when not limiting the search to R&D related articlces, and as the relevancy rate did not decrease that much, it was decided that the formal search should be done from the whole articles. The idea was to find enough relevant articles.

First Formal Search

The formal search was carried out to clarify the methods and tools that are used for scanning the competitive environment.

Research methodology of first formal search

The search criteria: ("strategic planning" or "strategic technology planning" or "technology strategy") and (knowledge or information or expertise) and (tool or method or gathering or acquiring or collecting or screening or monitoring or sharing or transferring or scanning) resulted in good amount of relevant articles, out of which six articles were published in the Marketing Intelligence and Planning publication. To find more relevant articles, all the articles published in the Marketing Intelligence and Planning after year 1995 were reviewed, and some new articles were found. Therefore, 32 relevant articles were found.

First formal search

The results of the first formal search are here categorized according to their topics:

- Generic, conceptual work without any concrete methodologies proposed: 16 articles, (50 percentage). Examples of articles belonging to this category are articles explaining which factors influence the strategic planning formality based on responses from 90 multinational corporations (Morgan & Hunt 2002; Chae & Hill 2000). In addition, Ngamkroeckjoti and Johri discuss the role of regional head quarters of large companies in environmental scanning and Keogh, Steward and Mulvie brief on organizational learning practices in the companies. (Ngamkroeckjoti & Johri 2000; Keogh & Steward & Mulvie 2000)
- Knowledge management methods (e.g. knowledge sharing): zero articles.
- Competitive/business/market intelligence methods: three articles. For example, Wright, Pickton, Callow discuss the danger of being too customer focus in marketing strategy planning and therefore clarifying how companies should perform CI activities for creating proper marketing strategy (Wright & Pickton & Callow 2002). Than and Ahmed discuss SWOT for processing information in BI activities, and Wee explain the role of Internet in market intelligence (Than & Ahmed 1999; Wee 2001)
- Quality management related methods: 1 article mentioning that QFD could be used besides planning for service quality also to other design and planning activities (Stuart & Tax 1996).
- SWOT: Two articles. Examples of articles belonging to this category are from Ruocco and Proctor, and from Tan and Ahmed (Ruocco & Proctor 1994; Tan & Ahmed 1999).
- Other IT based methods (search engines, internet, management information systems, filtering): 10 articles. Example article belonging to this category discusses market intelligence systems including human-computer based data filtering process (Xu 1999). Another example discuss IT enabled marketing combining product and market knowledge, and third example explain framework for Hybrid intelligent system containing support for supporting strategic analyses and combining its results with managers judgment, combining diverse support techniques and different strategic analysis models (Peters 1997; Li & Duan & Kinman & Edwards 1999). Last examples explain results of implementing such hybrid system (Li 2000) and how agents can be used to enhance strategic planning (Liu, 1998).

The methods are described later in this study with more details.

Second Formal Search

The second formal search using the "environmental scanning" and (paper or article) criteria resulted in 1430 articles. Approximately 30 percentages of the first 200 articles discussed how to acquire knowledge of the competitive environment. Some described environmental scanning activities done by single organizations and others described the results of their environmental scans without documenting used methodology and experiences of its usage.

- Generic, conceptual work without any concrete methodologies proposed: 37 articles. Example articles belonging to this category discuss issues that have prevented scanning to be institutionalized and explain what is environmental scanning and how scanning can be conducted (Chabus & Lesca 1999; Hale 2003; Virranniemi 2003; Morrison 2003; Choo 1994; Choo 1997; Choo 2001).
- Knowledge management methods (e.g. knowledge sharing): no articles However, many articles were describing the information acquisition in general from the perspectives closely related to knowledge management – therefore knowledge management literature could provide fresh ideas how to acquire information of competitive environment. Example articles discuss how information professionals are essential part of the environmental scanning and information integration process together with the information users and information systems (Lindsey-King 1998; Choo 2000b).
- Competitive/business/market intelligence methods: eight articles. Examples of articles belonging to this category are from Ambire SI, from Lang and from Delphi (Ambire SI 2003b; Lang 2003; Delphi 2003). The methods in these articles are described later. Mathers also briefly discusses several methods, e.g. portfolio analyses, brainstorming, competitive analysis and stakeholder analysis and classification (Mathers 2003).
- Quality management related methods: four articles. Examples are from Ambire SI, from Marton and Choo, from Lazof and from Mathers (Ambire SI 2003c, Marton & Choo, 2002; Lazof 2003; Mathers 2003).
- SWOT: Few articles, the articles were from Ambire SI, from Kogh, and from Mathers (Ambire SI 2003; Kogh, 2003; Mathers 2003)
- Other IT based methods (search engines, internet, management information systems, filtering): 13 articles Examples of articles belonging to this category are Wheelwright discussing hit management, and articles from Turoff and Hiltz, from National Library of Canada, and from Parker and Nitse (Wheelwright 2003; Turoff & Hiltz 2003; National Library of Canada 1999; Parker & Nitse 2003).

The methods are described later. Besides the described methods, a lot of valuable, conceptual work was found.

Conclusions of Information Management Systems

The information overload and infostress exist even though different kind of information management systems has been established. Typically established systems do not support strategic planning by providing proper information, and majority of the information is in the

heads of the managers or the sales force. Too often good quality information is not available and takes too long time to search for among all the available data, therefore strategic decisions are often done with gut feeling instead of facts. (Xu 1999; Fletcher & Donaghy 1993)

Few knowledge or intelligence based systems have been designed, however most of the studies describe only the conceptual design, not the practical application. Most of the systems are only prototypes never been taken into use. In addition, the existing systems, e.g. executive information systems, provide answers and information to questions that have been set beforehand, but most probably fail to provide correct information when unexpected things happen.

Therefore, managers do not have good tool and system support for strategic scanning. This is especially surprising when considering that managers suffer from especially high information overload related to strategic planning tasks. As a consequence, managements understanding of their competitors is often minimal, casual and even inaccurate. However, management acknowledges competitive environment knowledge is something they ought to know to be successful in strategic choices (Xu & Kaye 1995). Since the continuous flow of information is needed in these fast changing times and dynamic industries, scanning needs to be performed on a systematic and continuous basis, and therefore Internet as the free information source becomes very interesting for scanning. (Wee 2001)

Using Internet for scanning can be enhanced with many ways, e.g. introducing systems that can search or recommend new jump sites or similar sites. Other means to enhance using Internet for scanning are encouraging to share bookmarks, web pages and URLs, designing corporate portals that support viewing, enabling sharing web-based information with e-mail, training on notification services, pre selecting high-quality information sources, prepackaging and training advanced search methods. (Choo 2000)

The following section presents some advanced computer based information management systems, which have been developed to support managers to scan the competitive environment.

Intelligent Marketing Information Systems (IMkIS)

Marketing information, computer technology and changing managerial consciousness for time and cost-effectiveness are the basis for marketing information system (MkIS), including data acquisition, database management, graphical and statistical analysis tools, model base, directories and retrieval functionality. However, the large volume of information does not support management needs and rather overwhelms and confuses them. (Amaravadi & Samaddar & Dutta 1995) Some descriptions of the MkIS and CIS systems exist (Amaravadi et all. 1995; Fletcher & Donaghy 1993; Xu 1999), mainly describing the designs of such systems. However, the systems mainly exist in early stages of development without successful deployment (Xu 1999; Fletcher & Donaghy 1993; Talvinen & Saarinen 1995).

Xu claims that the MkIS implementations should be improved with features for environmental scanning, competition mapping, market positioning and SWOT analysis. Xu proposes that company should differentiate and identify most influential environment factors for scanning, convert vision and tacit knowledge to guide organization-wide information

scanning, and enhance data filtering and synthesizing (Xu 1995). Intelligent Marketing Information System is used to aid decision-making of managers utilizing artificial intelligence technology, to help strategic analysis, to couple analysis to managers' judgment, to combine the benefits of the different strategic analysis models and to help strategic thinking (Li et all 1999). It represents and processes assorted marketing knowledge, providing access to online databases, various types of reports for decision making, and knowledge base with knowledge about various aspects of marketing, enabling expertise to be accessed and shared easily. (Amaravadi et all 1995)

Gordon and Glenn propose to build databases, into which the information is entered using predefined templates with questions that guide for standard form and considering the same view points, based on interviews, group judgments of expert panels, scanning on line databases and reading periodicals. (Gordon & Glenn 1994)

Methods

This section presents the methods for scanning the competitive environment, which were described in the literature:

Methods from the Literature

This section presents the methods for scanning the competitive environment, which were described in the literature. The methods are grouped into categories according to the recognized similarities in the methods, and the challenges associated to them.

- Expert essays are prepared by carefully chosen experts with a topic of particular importance, they will provide information useful to long-range planning. Essays should have standardized format, especially for outline, length, footnotes etc. (Gordon, Glenn 1994)
- Expert panels are occasions, where a small number of respondents discuss and cooperate to synthesize opinions of an important topic. Participants are asked to provide observations and judgments about important developments that are underway, expected and suggested by other panelists. (Gordon, Glenn 1994)
- Delphi is a method of forecasting based on expert opinion and seeking the group opinion through consensus. It gathers opinions of experts on happenings in the environment containing reiteration and feedback after each round. Delphi is based on the idea that a group of experts is better than one expert when exact knowledge is not available. (Van Vuuren 2001, Kaynak *et al.* 1994, Delphi 2003)
- GSV (Gearing-Swart-Var's) technique is similar than Delphi, however it does not seek expert consensus. (Kaynak *et al.* 1994)
- Delphi Conference is one of the innovations using Delphi, where computer system enables individuals communicating rapidly in generating the forecast and forming the group opinion. (Kaynak *et al.* 1994)
- Think tank is group methodology used for analyzing the environmental context and deciding on recommendations for responding strategies. (Morgan, Hunt 2002)

The positive character of these methods is the possibility of providing good quality, well-analyzed results. The results can be presented in the form of explicit knowledge and artifacts that are easy to distribute in global organizations, and the reports can be recent, relevant and reliable, if they are prepared on request when certain strategic decision needs to be made. If reports are not prepared on request for a specific purpose, the quality as fitness for use might be lower. In addition, manager's willingness to acquire knowledge through discussions is not considered in these methods. The usage of these methods requires plenty of time and cost, and therefore they are not suitable for continuous scanning in most of the organizations. In addition, using expert panels, Delphi, Delphi Conference and Think Tank, most innovative opinions can be neglected when the group consensus is searched, which means that the results cannot be such that they would enable the company to differentiate, and succeed based on usage of non-trivial knowledge of the competitive environment.

- Hit management means that search results are stored with the explanations and shared among other users, agents, push technology and filters. (Wheelwright 2003)
- Government agencies can be contacted and asked to provide data, this can be done with low costs, however it might be slow. (Malhotra 1996)
- Investment communities can have data of the company that is not widely available for other users. (Malhotra 1996)
- Surveys and interviews provide in-depth perspective to the related issues. (Malhotra 1996)
- On-site/drive by observations is used to note visible changes e.g., competitor constructing a new building, full parking spaces, information on suppliers or customers etc. (Malhotra 1996)
- Reverse engineering means observing and investigating competitors products to understand better their quality and costs. (Malhotra 1996)
- Benchmarking as market research tool has grown in popularity because of the support it provides for the strategic planning by indicating how to eliminate excess capacity, outsource or modify existing processes. Process benchmarking highlights the activities and processes, which the firm has superior performance or cost advantage compared to its competitors. Specific process benchmarking partnerships are established to facilitate the benchmarking. (Ralston *et al.* 2001)

These methods are efficient when acquiring knowledge of certain issues of the competitive environment. The methods cannot be used alone to scan the competitive environment continuously, however, they could be part of a bigger framework and process, as an additional package of methods that could be used on need basis. Hit management is a method that is well suited for distributed usage, and therefore it could be an essential part of the process used for sharing the acquired knowledge with others in distributed environments and for virtual teams.

- SWOT is one the most commonly used tools for strategic planning, combining company's external and internal aspects for analysis, and combining quantitative and qualitative aspects. SWOT encourages discussion and facilitates it by suggesting issues to consider and analyze (Curry 1996).
- Computer-based SWOT works similarly, suggesting topics, which are either generic or based on data in the information systems, e.g., in executive information systems (EIS). (Curry 1996).

- Scenario building and analysis means developing a time-ordered sequence of events bearing a logical cause and effect relationship. The final forecast is based on multiple options, each with its own probability to occur. (Van Vuuren 2001)
- Competitor scenarios are used for understanding competitors' potential moves as well as the potential emerge of new rivals. Scenarios examine in which market segment the competitor will compete, how it competes and what is its target. The scenarios can be built unconstrained (posing any questions) or constrained. (Fahey 2003)
- Trend-impact analysis projects future trends from past information. (Van Vuuren 2001)
- War gaming is used to experience decision-making in simulated conditions. The method recognizes the importance of identifying alternative courses of action rather than simply one proposal. (Mc Nelly 2002)

These methods are efficient for synthesizing, analyzing and summarizing information of the competitive environment. The methods cannot be used alone to scan the competitive environment continuously, however, they could be part of a bigger framework and process, as a set methods out of which one or several could be picked for the knowledge construction. The methods encourage combining business and technology considerations, and to reduce the amount of transferred information e.g., by filtering or synthesing. The information is also integrated to existing information. Methods also improve sharing expertise within the company.

- EIS (Executive Information System) is an information system storing and providing data for information management purposes for executive managers. (Curry 1996)
- CIS (Competitor Information System) is information system built, using intelligence, for managing data of competitors for strategic planning purposes. It is built after identifying key strategic issues, strategic competitor groups and analysis made based on this information. (Fletcher, Donaghy 1994)
- SIS (Strategic Information Systems) is information system built by collecting data for management information purposes. Libraries could be the organization collecting the data. (Adams 1995)

Building an information system utilized to collect, to store and to provide data could be an efficient mean to manage the information. Such systems must be part of a bigger framework and process to be used for the knowledge acquisition, construction and sharing. Especially suitable such systems are in distributed environments, and they could be applicable for continuous scanning as well. From the presented systems, the Strategic Information System could be the best approach, since such system is not limited for executive usage only as EIS, or for competitor information only as CIS.

- Issues management consists of the following phases that were originally presented by William L. Renfro: 1. Issue definitions based on emerging issues noted based on literature, conferences or Delphi, 2. Issues are evaluated, their probabilities and impacts are considered and they are prioritized 3. Top 3-5 consensus issues are selected 4. Strategy is selected (Gordon, Glenn 1994)
- QUEST is a scanning procedure helping to share views and develop a shared understanding of high priority issues, options, eventualities and their implications for

> organizational strategies and policies. It produces a) a broad analysis of the environment b) assessment of the capacity and strategic options for dealing with the environment. The procedure involves four phases, which are preparation, scanning workshop, intermediate analysis and strategic options workshop. (Gordon, Glenn 1994)

Issues management and QUEST are very attractive holistic approaches, providing a framework, or its piece, how to scan the competitive environment. As such, they do not offer solutions to most of the recognized challenges, e.g., combining business and technology considerations or scanning the whole competitive environment instead of only customers, or managers preference of using their informal networks as source of information, however, the method neither prevents combining methods or tools that would provide solutions for those challenges. Quest uses workshops in scanning and assessing the strategic options for the organization.

Analysis and Conclusions

Managers suffer from information overload, therefore, instead of providing more information, companies should concentrate on providing good quality information for the decision makers. Some advanced computerized information filtering practices do exists, and they should be further developed to support people well, efficiently and with low costs in this difficult task.

Due to the fact that best information filtering happens through humans, the most effective and best solution in the future is human-computer based information processing. Despite this recognisition, most of the described methods for scanning the competitive environment are concentrating on either processing the information by people or processing the information by computers, without combining them. On the other hand, it is noted that most of the methods rightly concentrate on providing analyzed information for the managers, instead of purely acquiring more any kind of information on the competitive environment.

Despite the existing process descriptions, most companies do not have defined scanning process at all. This can be claimed based on the remarks in many articles e.g. Choo, Van Vuuren. Also, the amount of conceptual studies and the lack of surveys and mathematical models as research types indicate that the field is new and constructions are not widely implemented, based on the logic of emerging new theory (see e.g. Eisenhardt 1989), which explains that if the field of the study is difficult, conflicting or new, conceptual methods are popular. Later, single and multi-case studies start to appear to test the conceptual models, then surveys when the field of study is more mature and finally, when the theory base of the subject area is established, mathematical methods are used. (Karhu Kekäle, 2003) Since articles describing methods for scanning the competitive environment are rare, the field is not close to maturity.

Because the search was done in two parts, the first search from Emerald publications and the second search from the whole Internet using "environmental scanning" phrase for searching, the results are considered reliable. Even though the recency of the information is not in this study very critical quality factor, the selected articles were published during the past 10 years; therefore, they are recent enough for this context. The used environmental scanning is a

concept commonly used only for acquiring knowledge of the competitive environment, however since it has been used mainly by a limited group of researches, using it for all searches would have provided too limited perspective.

Other interesting fact was that 23 percentage of the articles were published in the Marketing Intelligence and Planning publication, when other magazines had published only one or two articles – which indicates that marketing and sales representatives of the company are typically performing the competitive environmental scanning. This can easily cause customer focus to be dominant when scanning the competitive environment and furthermore competitor or technology analysis not to become popular. However, competitor or technology analysis would be important for successful new product development.

Fulfilling the aims of this paper are analysed here:

- Providing comprehensive picture of the existing scanning practices in order for companies to compare their own practices to the existing state of art, has been fulfilled by the amount of scanned articles and the provides summarization.
- Providing a baseline of existing practices in order to compare their suggestions and their constructions, has been fulfilled by the amount of scanned articles and the provides summarization.
- Finding innovative improvement ideas and new methods for improving their scanning activities for practitioners and for researchers for further development, has been fulfilled by some of the described methods e.g. CIS, that are currently developed only until prototypes.

Summary

This article has described search methodology and received results on which methods and tools are used for scanning competitive environment. The search was done in two parts, the first search in Emerald publications and the second search from the whole internet using "environmental scanning" phrase for searching.

As result, many conceptual descriptions of the topic were found, explaining why this activity is important and proposing improvements. Some descriptions of specific methods were found as well, e.g. SWOT, QFD, expert essays and panels, literature reviews, agents, push technology, filters, government agencies, investment communities, surveys, interviews, reverse engineering, EIS and Delphi. Especially effective could be processes combining human-computer mixed information processing. Despite existing methods and process descriptions, most companies do not have systematic process at all.

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