Social, Organizational, and Technological Conditions that enable Knowledge Sharing

Paul van den Brink

Cover illustration: Dave Makin, http://www.crosswinds.net/~makinmagic/

SOCIAL, ORGANIZATIONAL, AND TECHNOLOGICAL CONDITIONS THAT ENABLE KNOWLEDGE SHARING

PROEFSCHRIFT

ter verkrijging van de graad van doctor
aan de Technische Universiteit Delft,
op gezag van de Rector Magnificus Prof.dr.ir. J.T. Fokkema,
voorzitter van het College voor Promoties,
in het openbaar te verdedigen op dinsdag 11 november 2003 om 15.30 uur

door
Paul VAN DEN BRINK
doctorandus in de informatica, master of business administration
geboren te Amsterdam

Dit proefschrift is goedgekeurd door de promotor:

Prof.dr. H.G. Sol

Samenstelling promotiecommissie:

Rector Magnificus,	voorzitter
Prof.dr. H.G. Sol,	Technische Universiteit Delft, promotor
Prof.dr. J.H. Andriessen,	Technische Universiteit Delft
Prof.dr. S.K.Th. Boersma,	Universiteit van Groningen
Prof.dr. P.G.W. Keen,	Technische Universiteit Delft
Prof.drs. J.S. Mackenzie Owen,	Universiteit van Amsterdam
Prof.dr.ir. A. Verbraeck,	University of Maryland
Prof.dr.ir. G.J. de Vreede,	University of Nebraska

ISBN 90-9014-681-4
NUGI 684

For Sanderella and my parents

i ACKNOWLEDGEMENTS

My most sincere gratitude goes out to the following people. I am deeply indebted to my promoter Henk Sol. Henk has offered me exceptionally professional guidance and was always able to put his finger on the weak spots. It was a real pleasure working with him.

The thorough comments that Erik Andriessen of the Delft University of Technology made on draft versions were helpful and very valuable. His expert advice is highly appreciated. The observations of Gert-Jan de Vreede of the University of Nebraska were relevant, constructive, and well valued.

I heartily thank Theo Siraa from the Ministry of Housing, Spatial Planning, and the Environment for the very congenial and professional way of working together. I also want to express my heartfelt gratitude to Hilbert Bruins Slot and Ger Bijster from Unilever Research & Development for their stimulation, professional cooperation, and good-natured collaboration.

I am much obliged to the experts Daan Andriessen, Olaf Beelen, Thijs Boekhoff, Noor Christoph, Arjan Evers, Paul Iske, Dany Jacobs, Jan Kingma, John Mackenzie Owen, Johan Oldenkamp, Theo Siraa, Frans Smeets, Jan de Vuijst, Anita van der Wal, Mathieu Weggeman, and Dirk de Wit who commented on the model developed. The inadequacies they observed and the improvements they suggested were very welcome.

My gratitude goes out to the esteemed paranymphs Rob Krams and Rein Nobel. The kind hospitality of Agnes Fowler whenever I visited the faculty is greatly appreciated.

I am especially grateful to my loving wife Sanderella Plak for her continuous encouragement and support, and for her patience with me even when that meant self-sacrifice. I truly value and cherish this.

Paul van den Brink
The Hague, September 2003

ii TABLE OF CONTENTS

iii LIST OF FIGURES

iv LIST OF TABLES

v SUMMARY

SOCIAL, ORGANIZATIONAL, AND TECHNOLOGICAL CONDITIONS THAT ENABLE KNOWLEDGE SHARING

The increasing pace of change in our society creates the need for organizations to cope effectively with this changing environment. The sharing of knowledge may help organizations to do so. This dissertation studies conditions that facilitate knowledge sharing between people. The primary objective of the research is to understand and gain insight into these conditions to help organizations to become more effective in knowledge sharing. Our research approach focuses on theory building with a practical value.

Our study builds on a synthesis of the theory of Nonaka and Takeuchi (1995) about knowledge creation and the model of Orlikowski (1992) on the concept of technology in organizations. This resulted in an elaboration on the knowledge sharing processes that may exist in an organization, an explanation of the three entities people, organization, and (information and communication) technology and their role in knowledge sharing, and an examination of the relationship between these processes and entities.

Chapter 1 considers the developments in our society that may cause this increasing pace of change. Learning — i.e. knowledge sharing — and adapting is a critical success factor for all organizations that participate in a dynamic environment in order to stay in synchronization with their surrounding. In this process knowledge plays a pivotal role. The notion of knowledge is explained through definition of the concepts data, information, and (explicit and tacit) knowledge. We conclude this chapter with a description of the problem we will study in this research.

The research question and goal are described in Chapter 2. Organizations face problems when they want to create and sustain an environment that enables and encourages knowledge sharing. They should provide for conditions such that people can trust each other, work together, are motivated to share ideas, and can engage in dialogues. The purpose of this dissertation is to identify and understand the conditions that may facilitate knowledge sharing. Therefore we address the following research question: "*Which conditions facilitate the sharing of knowledge between people in an organization?*" and the related research goal: "*Identify the relevant conditions and enablers that facilitate knowledge sharing between people in an organization.*"

The research approach consists of a principle, strategy, and instrument. Due to the explorative nature of our study we choose the interpretive philosophy as our research principle. The inductive-hypothetical model cycle — our research strategy — incorporates this philosophy and it helps to investigate both theoretical and practical issues, and to distinguish between descriptive and prescriptive aspects of our study. Within this framework the case study research was chosen as our research instrument.

We extend the knowledge creation theory of Nonaka and Takeuchi (1995) in Chapter 3 with the management of codified or explicit knowledge to define the knowledge sharing processes that can occur in an organization. The following organizational knowledge sharing processes are identified: creating knowledge — tacit-to-tacit, tacit-to-explicit,

explicit-to-explicit, explicit-to-tacit —, valuation of new explicit knowledge, organizing & classifying assessed explicit knowledge, storing structured explicit knowledge, maintaining and refining stored explicit knowledge, distributing stored explicit knowledge, accessing stored explicit knowledge, using explicit knowledge, and using tacit knowledge.

We discuss the model of Orlikowski (1992) — which treats the influences of people, organization, and technology and their interactions, because we consider these three entities as the key factors in knowledge sharing. For the human factor we discuss the drivers that motivate people to do what they do, the possible skill levels of an individual in an organization, and the roles an individual can play in an organization. Organizational dimensions are analyzed using the 7S framework by McKinsey, which consists of seven related factors: strategy, structure, systems, staff, skills, style, and shared values. The technology factor and the potentialities of (information and communication) technology to support knowledge sharing are detailed by grouping their functionalities: office applications, groupware, document systems, work process systems, analytical systems, and knowledge systems.

Two organizations of quite a different nature — two of our case studies — are analyzed in Chapter 4 through the human, organizational, and technological factors that influence their knowledge sharing processes. We identify conditions that may help to incorporate knowledge sharing in the way of working in these organizations.

Chapter 5 describes the — in our opinion most relevant — conditions that facilitate knowledge sharing in an organization. These conditions are structured into social, organizational, and technological factors:

social: care, trust, empowerment, competence leverage, appraisal, and knowledge crew;

organizational: climate of openness, dialogue, community, organically structured organization, collaboration, learning organization, slack, knowledge champion, system integrated into daily workprocess, and metric;

technological: knowledge repository, knowledge routemap, and collaborative platform.

In Chapter 6 we propose that the development of an organization with respect to knowledge sharing can be characterized by several phases. The following phases are identified: the unawareness phase, knowledge repository phase, knowledge routemap phase, collaborative platform phase, and organizational learning phase.

We construct a model in which we consider two types of knowledge sharing strategy: codification or personalization. Our model therefore consists of two matrices — one for each type of strategy — in which the different phases, associated with the development of knowledge sharing, are incorporated. In these two matrices each phase is related to their most appropriate social, organizational, and technological conditions that enable knowledge sharing (see the table below).

CODIFICATION STRATEGY			
	People	**Organization**	**Technology**
Unawareness phase	none		

CODIFICATION STRATEGY			
	People	**Organization**	**Technology**
Knowledge repository phase	appraisal, competence leverage	slack, system integrated into daily workprocess	knowledge repository
Knowledge routemap phase	knowledge crew	knowledge champion, metric	knowledge routemap
Collaborative platform phase	trust, care, empowerment	climate of openness, dialogue, community, collaboration	collaborative platform
Organizational learning phase		organically structured organization, learning organization	
PERSONALIZATION STRATEGY			
	People	**Organization**	**Technology**
Unawareness phase	none		
Collaborative platform phase	trust, care, appraisal, competence leverage, empowerment	climate of openness, slack, dialogue, community, knowledge champion, collaboration	collaborative platform
Knowledge routemap phase	knowledge crew	metric	knowledge routemap
Knowledge repository phase		system integrated into daily workprocess	knowledge repository
Organizational learning phase		organically structured organization, learning organization	

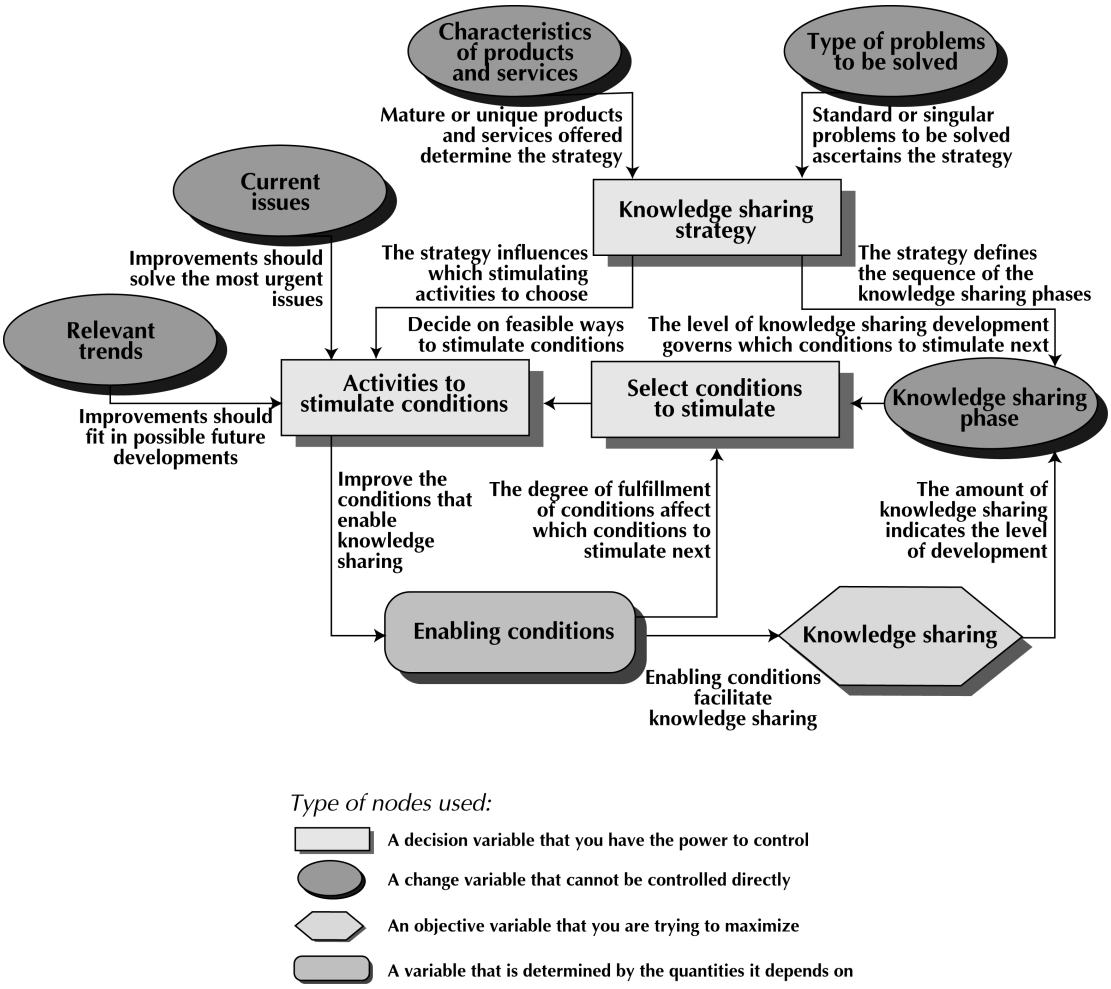
In Chapter 7 we present a repeating process of assessment and action (see the figure on the next page) to implement our prescriptive conceptual model. We describe action as the stimulation of appropriate enabling conditions. By assessing conditions that enable knowledge sharing in an organization, before and some time after a condition is stimulated, a change in the degree of knowledge sharing may become visible. This variation may become an indicator of the effectiveness of (one or more) conditions in facilitating knowledge sharing and can help to test our model.

Our repeating process of assessment and action is based on a pragmatic assessment of the enabling conditions that facilitate knowledge sharing. This enables us to obtain an indication of the level of knowledge sharing in an organization. Given the type of knowledge sharing strategy deployed, this level of knowledge sharing allows us to derive, for the organization at hand, the applicable knowledge sharing phase.

Related to each phase are conditions that are the most appropriate to stimulate. Based on the identified knowledge sharing phase and the degree of fulfillment of its related conditions we decide whether to enhance the current knowledge sharing phase or to facilitate a transition from the present into the next knowledge sharing phase.

When we correlate current issues or problems of this organization with possible, relevant trends we can determine the most viable way to realize stimulations of these enabling

conditions. The effect of these stimulations can subsequently be assessed and can give rise to further action.



In Chapter 8 we describe the implementation of our prescriptive conceptual model through a process of assessment and action in three case studies: Getronics Consulting, the Ministry of Housing, Spatial Planning, and the Environment, and Unilever Research & Development.

In Chapter 9 we evaluate our prescriptive empirical model. We use the experiences from applying our repeating process of assessment and action in three dissimilar organizations to reflect whether our prescriptive empirical model tallies with and confirms the primary objective of this dissertation: to systematically study, identify, and understand the enabling conditions to help organizations to become more effective in knowledge sharing.

Through a number of expert interviews we elaborate on the validation of our prescriptive empirical model. These experts are subject matter professionals who are regarded as capable to form an accepted scientific opinion on our model. We address the issue whether our model is in accordance with observations from reality, respecting the interpretive philosophy we adopted for this research.

Based on the comments given by subject matter experts and our experiences from the three prescriptive empirical models, we propose an improved model.

In Chapter 10 we present an evaluation of our study, offer suggestions for future research, and conclude our research. We summarize the main outcome from our research as follows, it offers:

- a contribution to the theoretical understanding of the requirements for knowledge sharing in organizations and an improved insight into the processes involved in sharing of tacit and explicit knowledge;
- the identification of social, organizational, and technological conditions that facilitate knowledge sharing in an organization and the definition of phases that reflect a certain stage in the development of knowledge sharing in an organization;
- the description of a repeating process of assessment and action that identifies customized activities to enhance knowledge sharing in an organization.

We emphasize that knowledge sharing is a complex beast influenced by numerous factors. It would be oversimplifying reality to claim there is one particular remedy. In our research we identified a framework of conditions relevant for knowledge sharing. We argue that knowledge sharing between people in an organization is embedded in the way of thinking and in the way of working, and that it can be enabled by stimulating the right social, organizational, and technological conditions.

Paul van den Brink

1 STIMULI FOR KNOWLEDGE SHARING

Knowledge is the most democratic source of power.
A. Toffler

1.1 Introduction

Organizations are confronted with an ever changing environment. The increasing pace of change in our society emphasizes the necessity for organizations to adapt to and cope with environmental uncertainty. Choo (1995a) argues that in order to cope effectively with their changing environment organizations and their employees should act as a learning organism and be adaptive, innovative, and able to process information about that environment, and be able to turn this information into knowledge and share this within the organization.

Knowledge sharing is about stimulating the exchange of experiences, ideas, and thoughts between people. Organizations can create and sustain an environment that encourages knowledge sharing, i.e. they can provide for conditions that enable such an environment. This dissertation identifies and studies conditions that facilitate knowledge sharing between people. The primary objective of the research is to understand and gain insight into these conditions to help organizations to become more effective in knowledge sharing.

In this chapter the stimuli for knowledge sharing in an organization are discussed. First, the social and technological developments in our society that may cause the increasing pace of change are considered. Next, we address in what way organizations can cope with such a turbulent environment. Third, knowledge and knowledge sharing are defined for we consider this as key factors that enable organizations to stay in synchronization with their surrounding. Finally, we describe the problem we will study in this research.

1.2 Pace of change

This section discusses the increasing pace of change in our society and some of the most relevant developments that possibly influence this process.

1.2.1 Transition to the knowledge economy

The first transition in human society was from a hunter-gatherer economy to an agricultural economy based on natural resources: land, agriculture, mining, and fishing. Then emphasis shifted to the industrial economy and capital: money, factories, and machines (Stewart, 1997a; Vogt, 1995). “Now we are entering a third period of change: the shift from the command-and-control organization, the organization of departments and divisions, to the information-based organization, the organization of knowledge specialists” (Drucker, 1988). The transition to the knowledge economy can be typified through the increasing replacement of (manual) labor by information and knowledge as the means of production (Quinn, 1992; Malhotra, 1993). The focus shifts from what you own to what you know, from tangible to immaterial, from paper to digital (Stewart, 1997a; Toffler, 1991).

Consider the time between these transitions, for this tempo is remarkable. We observe that the nature of work and society is changing at an increasing pace of time. It started with the invention of the digging stick and the appearance of agriculture in 6.000 BC. The second technical innovation has been the oxen-led scratch plow that took place around 2.000 BC: some 4.000 years later. After that, the pace of innovation constantly increased (Kurzweil, 1999; Vogt, 1995). Diamond (1998) argues: "Technology begets technology, it is an auto catalytic process: that is, one that speeds up at a rate that increases with time, because the process catalyzes itself. The explosion of technology since the Industrial Revolution impresses us today, but the medieval explosion was equally impressive compared with that of the Bronze Age, which in turn dwarfed that of the Upper Paleolithic." Zorpette and Ezzell (1999) comment on the development of technology as follows: "In the century now closing, we have gone from gaping at electric lightbulbs and telephones to channel-surfing past images of a sunrise on Mars, to outbursts of pique if our e-mail takes more than a few minutes to get to the other side of the world."

Quinn (1992) claims a major role for technology and knowledge combined: "The main reason for this impressive change of our society is the advancing usage of knowledge combined with the increasing possibilities of information and communication technology." Our society develops into a knowledge economy with an increasing need for knowledge. Drucker (1997) states that it is likely that the productivity of knowledge and knowledge workers will become the decisive factor in the world economy. Acquisition, creation, manipulation, interpretation, and use of information and knowledge will be crucial competitive advantages (Stata, 1989). Toffler (1991) underlines this: "The paradigm of the advanced economy focuses more on connectivity rather than disconnectedness, integration rather than disintegration, real-time simultaneity rather than sequential stages. Labor in the advanced economy no longer consists of working on 'things', writes historian Mark Poster of the University of California (Irvine), but of *men and women acting on other men and women, or … people acting on information and information acting on people*."

1.2.2 Forces of change

Which developments cause this increasing pace of change? Senge (1992) observes that "A wide array of forces of change in the contemporary organizational context is discernible: increasing uncertainty, economic and political turbulence, changing demographics, the increasing interdependence of global markets and global enterprises, strategic alliances, flattening, re-engineering, restructuring, reorganizing, downsizing and rightsizing of the organization, the shorter life-cycle of products, rapid technological developments, and instantaneous communications."

Some of the most relevant social and technological developments in our society that call for organizational realignment are (Toffler, 1991; Kurzweil, 1999; Anderson, 1997; Horn, 1999; Jarvenpaa and Ives, 1994; Vogt, 1995):

Increasing complexity of society

The complexity of our society grows. With that, the issues an organization faces also become more complex and are often interrelated. Solutions are complicated and frequently only attainable through the synergetic effort of several, heterogeneous experts.

Global competition

Global competition demands swift reactions to continuous and rapid developments in the environment. If one company does not pursue some particular innovation, another

does, forcing related companies to do likewise or else be left economically behind. This time-pressure implores short organizational communication flows and an easy but thorough access to the necessary information and knowledge throughout one´s own community and beyond.

7*24-Hour services

A 24-hour service oriented society is focused on the fulfillment of the needs of the individual who has only a very limited amount of time at his or her disposal.

Knowledge content of products and services

"The knowledge content of products and services is intensifying. Because the knowledge content of work rises, jobs grow more individualized. Knowledge workers are less and less replaceable. The costs of replacing an employee grow, which is why organizations will invest more in their people (or in the "control of expertise and competence of — job-hopping — employees": Andriessen, 2001). The net result of such changes is that companies tend to use fewer but better paid workers than in the past" (Toffler, 1991).

Changing character of work

The character of work itself is changing. Manual labor is been replaced by brain labor, probably carried out in dynamic virtual workgroups. Correspondingly, the workplace becomes digital and electronic and due to an increasing mobility, work is not tied to the physical location at the office anymore, but is evolving into work done by nomads at a virtual office, when and where it suits them.

Need for personal development

People develop themselves: they climb the hierarchy of human needs (like the pyramid of Maslow). They want to satisfy more than their basic needs (food, shelter, and belonging) and seek in their work possibilities for individual development, progress, growth, self-respect and esteem, autonomy, and self-actualization (Krause, 1996; Senge, 1990).

Leverage effect of technology

The leverage effect of technology and the use of microchips is an important accelerator of the pace of change. The 'interlocked technology' implies that changes in technology go hand in hand with changes in society. Malhotra (1993) states: "The increasingly turbulent environment would feed the need for further [and greater] advancements in information technology which would further increase turbulence." Information and communication technology is capable of processing vast quantities of information and can pull down the barriers of time and geographic location. Three trends are identified by Conlon (2001):

- A steady drop in computer power costs, "enabling companies to create faster, smaller, and cheaper digital devices that can be integrated into everyday items. Last year, for example, General Motors shipped more computer power in its cars than IBM."
- The "exponential increase in connectivity, largely facilitated by the growth of the Internet, which is poised to double its user base to two billion by 2004. It provides a fast, convenient channel for transmitting digital products, services, and information. And the more people, objects, or computers that are connected to it, each a source of information, the greater its efficiency and value."
- The digitalization effect: digital technology can reproduce endlessly without any loss. "This creates huge economies of scale."

1.3 Coping with the changing environment

The description (in Subsection 1.2.2) of the social and technological developments that cause the increasing pace of change, helps us to identify in what way organizations may adapt to their turbulent environment. This section addresses the concept of the organization as a learning organism as an approach to cope with the changing environment, with learning and knowledge sharing as a way to improve adaptability.

1.3.1 Organizations as learning organisms

The above mentioned dynamic, complex, and often chaotic developments in our society have their effect on organizations. The increasing pace of change requires a continuous effort of people and organizations to meet the demands of this changing environment: people need to be connected to solve complex and interrelated problems together, their collaboration ought to be supported by an adequate technical infrastructure to avoid being hampered by geographic and time constraints, nor should they be obstructed by hierarchical organizational structures. Organizations will need to evolve from mechanical routine based systems into adaptive, open, and learning organisms (McGee and Prusak, 1996; Choo, 1995a; Stewart, 1997a; Malhotra, 1993).

The concept of organizations as a learning organism can be formulated as living systems that are dependent on the environment in which they live. “Churchman defined environment as those factors which not only are outside the system’s control but which determine in part how the system performs” (Malhotra, 1993). Organizations are seen as open, adaptive systems who live in constant interaction with their surrounding: “They form alliances with other adaptive systems and engage in information processing that changes the range of its potential objectives or the boundaries within which it can attract and use resources to achieve these objectives” (Mason, 1993).

“The ultimate criterion of organizational performance is long term survival and growth” write Fiol and Lyles (1985). Based on Darwin’s theory, Morgan (1986) asserts that for their survival and growth organizations are, just like organisms, dependent on their ability to accrue sufficient resources in their environment necessary to support their existence. In this process they have to compete with other organizations for the limited amount of available necessary resources, and only the strongest do survive. Therefore, which organizations will be successful will be determined foremost by the environment. According to Kenneth Boulder it is rather ‘survival of the fitting’ than ‘survival of the fittest’. Adaptation to and learning from the environment is the crux for survival. Stewart (1997a) exemplifies this biological metaphor: organizations concentrate on their core-activities — what they do best and learn how to do it better: to create an improved chance of survival —, thereby forming alliances — to create synergy with the environment — and contracting out their other work — to create dependencies in surrounding systems for support.

1.3.2 Learning and sharing of knowledge

To cope effectively with their changing environment, organizations and their employees should act as a learning organism and be adaptive, innovative, and able to process information about that environment, and be able to turn this information into knowledge (Choo,

1995a). A key aspect in this respect is learning, in the sense of being able to interpret signals and act upon them. “A person learns when he or she gains new knowledge and insights and applies this actively to their behavior. Also with organizational learning new insights imply adjusted operation. Organizational learning is the product of combined efforts, discussions, shared knowledge, ideas, insights, thoughts, and mental models” (Stata, 1989). Geus (1997) states: “The company must be able to alter its marketing strategy, its product range, its organizational form, and where and how it does its manufacturing. And once a company has adapted to a new environment, it is no longer the organization it used to be; it has evolved. That is the essence of learning.”

For an organization, learning is the process of adapting to one’s environment, just like all other living organisms (McGee and Prusak, 1996). In turbulent environments, learning by trial and error has to be sided by explicit, systematic learning. Stata (1989) claims that “the rate at which individuals and organizations learn may become the only sustainable competitive advantage, especially in knowledge-intensive industries”, in accordance with Adler and Cole (1993) that “consensus is emerging that the hallmark of tomorrow’s most effective organizations will be their capacity to learn.” Competitive advantages can be attained through collective learning in the organization, through combination and coordination of skills, competencies, and technologies. This means communication, involvement of people, and commitment to work across organizational boundaries that should be reflected in the corporate strategy (Prahalad and Hamel, 1990).

Facilitating learning means providing access to (digitally stored) information and supporting the sharing of knowledge between people through communication, coordination, and collaboration. We recognize as essential elements of organizational learning the (motivation of the) human factor, the transition of organizations to learning organisms, and the possibilities of information and communication technology.

1.4 Knowledge sharing

In the previous section we proposed that it is possible for organizations to effectively cope with a changing environment through learning and adapting. In this process knowledge plays an essential role; therefore we define in this section the concept of knowledge and of knowledge sharing.

1.4.1 What is knowledge

In Subsection 1.3.2 (on page 4) we referred to McGee and Prusak (1996) who argued that learning is the process of adapting to one’s environment. Huber (1991) defines learning as: “An entity learns if, through its processing of information, the range of its potential behaviors is changed. This definition holds whether the entity is a human or other animal, a group, an organization, an industry or a society. The information processing can involve acquiring, distributing or interpreting information.” We may conclude that learning is about assimilating, creating, and applying information and knowledge that enables us to accomplish tasks we could not perform before — in this respect, we treat learning as a result of knowledge sharing.

As knowledge plays a central part in learning and in knowledge sharing and because some (Toffler, 1991; Drucker, 1997) claim that knowledge is the basis for, and the driver of, our post-industrial economy, it makes sense to try to understand the notion of knowledge. The constructing elements of knowledge are data and information (Bellinger, 1998).

Data

Data means dispersed and more or less unconnected facts, images, or sounds, not yet interpreted or deemed useful. Data is without a meaningful relation to anything else and can be characters, integers, decimals, colors, noises, and dates.

For example the four bases in the DNA (Desoxyribo-Nucleic Acid), the nucleus of human cells, can be classified as data.

Information

Information is categorized or patterned data, a structure that produces meaning from associated data. In a decision making process you may use information that is created from generalized and structured data and presented in an understandable and interpretable way. Bellinger (1998) writes: "Information is quite simply an understanding of the relationships between pieces of data, or between pieces of data and other information."

For example of the 46 chromosomes — or 23 pairs of chromosomes — of the DNA, both the male and the female human being each possess 22 pairs of autosomes, or non-sex chromosomes, and one pair of sex chromosomes. For the male, the sex chromosomes are XY. For the female, the sex chromosomes are XX. Consequently, if you can determine the value of the sex chromosomes — the data — you are able to derive the sex of a person.

Knowledge

Knowledge is information that has been further refined into a validated platform for decision or action (Toffler, 1991). Snowden (2000) argues: "The function of knowledge in any organization is to make sense of things." Information makes it possible to interpret events or objects and thus is the fundament for eliciting and constructing knowledge. Information tends to be more static in time and linear in nature than knowledge (Bellinger, 1998). Denning (1998) mentions another difference: "it can be extremely easy and quick to transfer information from one place to another, it is often very difficult and slow to transfer knowledge from one person to another." "Knowledge is justified belief that increases an entity's capacity for effective action" observe Nonaka and Takeuchi (1995). It is information enriched with the insight of the individual within his or her perceived framework of reality (or mental model). Causal associations based on information generate knowledge on basis of which prescriptive or predictive decisions can be made.

For example if prenatal testing for fetal abnormalities detects the Down syndrome (or trisomy 21) because a person has an 'extra' 21st chromosome (three in stead of two), it may help parents in deciding their next steps, for instance having an abortion or not. In this example the data are the test results and the information is the observation that, because of the value of the test results, the Down syndrome has been identified. Based on this information, combined with knowledge about issues related to the upbringing of children with the Down syndrome, and taken into account personal, social, and religious beliefs, a decision can be made whether an abortion is considered appropriate.

Related concepts, but less relevant for this thesis, are *understanding*, which is about knowing why which knowledge is needed: it enables people to comprehend and solve complex problems (Quinn et al., 1996); *wisdom*, which requires understanding and insight, and is the ability to justly utilize knowledge and experience (Edwards, 1997); and *individual intelligence:* a person's capability to process, interpret, encode, manipulate, and access

information so as to acquire, retain, and apply knowledge quickly and successfully to meet external challenges or solve problems in a particular domain or context (Glynn, 1996). Individual intelligence is enabled by our intellectual abilities — that according to Minsky (1974) consist of reasoning, language, memory, and perception.

A definition of knowledge is, as stated by Davenport et al. (1998a): "Knowledge is information combined with experience, context, interpretation, and reflection. It is a high-value form of information that is ready to apply to decisions and actions." Knowledge and information is about (context specific and relational) meaning. Moreover, knowledge is also about beliefs, mental models, and commitment, and is actionable (Nonaka and Takeuchi, 1995).

Nonaka and Takeuchi (1995) distinguish between *explicit* and *tacit* knowledge and define conversion processes between these two types of knowledge (which is studied in more detail in Section 3.2 on page 21). They describe explicit knowledge as that which "can be expressed in words and numbers and can be easily communicated and shared in the form of hard data, scientific formulae, codified procedures, or universal principles." Tacit knowledge is identified by them as knowledge that "is highly personal and hard to formalize. Subjective insights, intuitions and hunches fall into this category of knowledge." Elliott (1996) writes: "Tacit knowledge ... is what you know by virtue of experience. I can look at videotapes about playing tennis, and I can read the books about it, but I still can't play tennis. So, there is a difference between what I can read about and what I can experience."

Next to explicit and tacit knowledge the concept of *cultural* knowledge (Choo, 1998) is occasionally used to indicate a sieve that — according to the cognitive and affective structures used by an individual — values and accepts certain knowledge and rejects knowledge that is deemed unimportant or not true.

One possible categorization of knowledge can be made into factual, procedural, social, and contextual knowledge (Oldenkamp, 2001; Knight, 2001):

- factual knowledge (*know what*) is about tacit or explicit knowledge of facts;
- procedural knowledge (*know how*) is knowledge about getting things done, for example knowledge about the processes and procedures involved but also expertise, skills, and competencies of people is considered as procedural knowledge;
- social knowledge (*know who*) is knowledge about who knows what: the personal networks of an individual;
- contextual knowledge (*know why*) is knowledge about relevant background information, for example knowledge about the specific way of working in an organization.

Another classification of knowledge can be made with respect to the type of knowledge (Oldenkamp, 2001; Knight, 2001): technical or expert knowledge (methods, techniques, and insight), process and project knowledge (formal and informal organizational knowledge), product and service knowledge (market oriented), and customer and supplier knowledge (relationship management).

1.4.2 Knowledge management and knowledge sharing

We saw in Section 1.3 (on page 4) that one of the key concepts of coping with the changing environment is to learn, i.e. to share knowledge. Knowledge sharing is a social activity and certainly not new. Expertise, best practice, tips, and tricks have been shared through the ages by mouth. Examples of face-to-face communications are knowledge transfer from father to son, teacher to pupil, or master to servant, or during gatherings like seminars, in guilds, or around a campfire. Knowledge sharing in an organization is a way to enhance the productivity of knowledge and of knowledge workers. Alavi and Leidner (1999) observe that "knowledge is of limited organizational value if it is not shared. The ability to integrate and apply specialized knowledge of organizational members is fundamental to a firm's ability to create and sustain competitive advantage." Knowledge sharing goes beyond simple information sharing and is about stimulating the exchange of experiences, ideas, and thoughts between people. According to Skyrme (1997) enterprise-wide and inter-enterprise knowledge sharing need complex layers of functionality in connection, communication, conversation, and collaboration between persons. "Not only are these technology layers, but they are process layers as well. The human and organizational factors become more important the higher the layer" (Skyrme, 1997).

Huysman and De Wit (2000) state that knowledge sharing "is more effective when it is centered on various [collective, organizational] levels of learning than on individual learning processes only." Knowledge sharing depends not only on how effectively the diverse individuals are able to organize and develop their unique knowledge competences, but also how they can integrate and utilize their distinctive knowledge both effectively and synergistically to create a collaborative, ongoing learning (Tenkasi and Boland, 1996). This leads us to suggest that learning in turbulent environments should take place in an explicit, systematic way: it needs to be managed.

Knowledge management is a set of policies, organizational structures, procedures, applications, and technologies (Bair, 1997), which defines a systematic social and technological process for creating, valuating, organizing and classifying, storing, maintaining and refining, distributing, accessing, using, and applying organizational knowledge as a resource (see Subsection 3.2.4 on page 25 for a definition of these knowledge sharing processes), just like the management of other resources or assets like for instance inventory.

Malhotra (1997) defines knowledge management as follows: "Knowledge Management caters to the critical issues of organizational adaptation, survival, and competence in face of increasingly discontinuous environmental change. Essentially, it embodies organizational processes that seek synergistic combination of data and information processing capacity of information technologies, and the creative and innovative capacity of human beings." Knowledge management focuses on supporting the tacit-to-tacit knowledge sharing that takes place when people interface with each other *and* on providing better access to digitally stored (explicit or codified) information. Tacit knowledge is held in people's heads, which is for an organization not in a very manageable form. One way — the explicit way — to improve this, is to store and give easy access to knowledge in an explicit form like documents, procedures, best practices, lessons learned, project evaluations, manuals, databases, and online trainings. Another way — the tacit way — is to facilitate and stimulate the knowledge transfer between people by making it very simple to have contact, communicate, and cooperate with each other.

Because knowledge *management* relates to a control mode of thinking, in this dissertation we prefer to use the term knowledge *sharing*. Knowledge sharing expresses the notion of equality better, which we consider a prerequisite for effective social interaction among people. Huysman and De Wit (2000) remark: "Although there exist many different conceptions of knowledge management, almost everyone agrees that knowledge management is about the support of knowledge sharing." In this dissertation the term knowledge sharing has a broad sense: it not only refers to social interaction between people but it also comprises the increase in knowledge of an individual through direct experience (like on the job learning or completing an educational course). We view knowledge sharing as a process in which a person who seeks knowledge is linked to sources of knowledge and a transfer of knowledge takes place.

1.5 Problem description

This chapter discussed stimuli for knowledge sharing. In the knowledge economy organizations can improve their competitiveness by connecting and sharing the knowledge of all their people. As Mohrman and Finegold (2000) put it: "Too often, employees in different parts of the organization spend their time rediscovering knowledge, learning the same lessons or reinventing solutions that already exist. The company then loses the opportunity to apply the knowledge and wastes the efforts of these employees. … In today's highly charged competitive environment, companies have to make their knowledge count. They can't afford to recreate the same knowledge over and over again in different parts of the organization. They have to link their employees to the best knowledge available — and then apply their talents to generate and use knowledge by establishing virtual teamwork and knowledge networks that allow employees throughout the world to access expertise wherever it is located. Problems get solved faster and knowledge is reused, not rediscovered."

Knowledge sharing is about stimulating the exchange of experiences, ideas, and thoughts between people. Organizations can create and sustain an environment that encourages knowledge sharing, i.e. they can provide for conditions that enable such an environment. Denning (2001) argues that these conditions need to facilitate a transition from the economics of transactions — an economy that "proceeds by way of transactions, each of which has explicit compensation built in to any transfers" — into the gift economy — where people share their knowledge, not on the expectation that they will instantly be compensated for their sharing, but rather in the expectation that "some time, some where, sooner or later, they will receive something back." The primary objective of this dissertation is to systematically study, identify, and understand these conditions. This may help organizations to become more effective in knowledge sharing.

The next chapter describes the research framework: what approach do we take to study the conditions that enable knowledge sharing in an organization.

2 RESEARCH FRAMEWORK

The following sentence is false.
The preceding sentence is true.
D.R. Hofstadter

2.1 Introduction

This chapter presents the research framework. The introduction discusses the nature of the problem under investigation. Within this perspective the research question and research goal are formulated. Subsequently, the research approach — to realize the research goal — is described, which consists of a research principle, a research strategy, and research instruments. The chapter concludes with an outline of the pursued research.

Chapter 1 describes the increasing pace of change in our society. We argue that organizations can deal effectively with their changing environment as adaptive, open, and learning organisms (McGee and Prusak, 1996; Choo, 1995a; Stewart, 1997a; Malhotra, 1993). Learning is defined in the sense of being able to interpret signals and act upon them. Using our definitions given in Subsection 1.4.1 (on page 5) we may assume that learning results from interpreting and using data, information, and knowledge. This learning process is fed by the sharing of knowledge between people in an organization through communication, coordination, and collaboration. In Section 1.5 (on page 9) we reason that organizations should provide conditions that enable and encourage this sharing of knowledge.

Our research into these conditions is hampered by a number of reasons. Daft and Weick (1984) state that most research assumes that organizations behave as static frameworks or mechanical systems, although organizations are among the most complex systems imaginable: they are vast, fragmented, and multidimensional. In addition knowledge sharing is about phenomena that are neither directly observable nor easily discernible (Lee, 1989). Some important aspects in this process can be identified, for instance the attitude of people; the degree of trust between people; the values, norms, and practices of an organization; and user acceptance of the information and communication technology applied. However, it is hard to quantify these aspects and this holds even more strongly for their interrelationships. Moreover, it is not simple to determine whether knowledge sharing has actually occurred: the period between acquiring and using knowledge may take some time and it is quite complex to relate behavioral change to knowledge sharing. Besides, any model about a theory of social behavior — and knowledge sharing between people is a social activity — cannot be simultaneously general, accurate, and simple. Daft and Weick observe (1984) that two of the three characteristics are possible, but only at a loss to the third. There is a difficult balance between a simple model and a complex model for use in real life situations. A simple model may do reality no justice but a complex model may be too cumbersome to be of practical use.

To overcome these setbacks the primary objective of the research is to understand and gain insight into conditions related to knowledge sharing in an organization. Our research approach focuses on theory building with a practical value: it aims to be general, applicable, and understandable.

2.2 Research question and research goal

Mohrman and Finegold (2000) illustrate clearly the problem at hand: they emphasize that in the knowledge economy organizations cannot afford to spend their time in recreating already existing knowledge. They argue that the only sustainable competitive advantage is the knowledge that employees are able to create, share, and use. Snowden (2002) asserts that this knowledge cannot be conscripted, it can only be volunteered. This requires organizations to create and sustain an environment that enables and encourages knowledge sharing. Organizations should provide for conditions such that people can trust each other, work together, are motivated to share ideas, and can engage in dialogues.

Lucier and Torsilieri (2000) observe the following difficulties that will be encountered in doing so: knowledge management "requires people to do things that are, well, unnatural. It demands that they share their best ideas freely, giving up a piece of their personal competitive advantage, often without getting credit. It also obliges them to use other people's knowledge, which means admitting that somebody knows more than they do. Finally, it requires that they keep looking for ways to improve — what's good enough today will never be good enough tomorrow. Knowledge management calls on us to steal boldly and let others pilfer freely from us, day after day."

In the literature attention has been paid to the issue of facilitating knowledge sharing, but often it is not addressed as an integrated issue, for it is mostly focused on specific characteristics like the culture of an organization or the attitude of people. Therefore the purpose of this dissertation is to help organizations to become more effective in knowledge sharing by identifying and understanding the conditions that may facilitate knowledge sharing in an integrated way. To gain insight into these conditions we address the following research question:

"Which conditions facilitate the sharing of knowledge between people in an organization?"

In order to answer this question the following research goal has to be achieved:

"Identify the relevant conditions and enablers that facilitate knowledge sharing between people in an organization."

This dissertation offers both practical and theoretical contributions. The practical contribution of this research is that it offers organizations insight that can support or improve knowledge sharing within that organization. The dissertation contributes to theory by combining previously unrelated studies about influences on knowledge sharing and extending them into one integrated model.

2.3 Research approach

The research approach systematically describes the activities that will be performed in order to achieve the research goal. The approach consists of three aspects (Vreede, 1995):

research principle: an underlying philosophy to guide the way the problem is studied;
research strategy: the method to accomplish the research goal;
research instruments: the tools to carry out or implement the strategy.

The research approach is chosen based on the characteristics of the research goal and the existing literature.

2.3.1 Research principle

The research principle guides the flow of thought or philosophy in which the problem is approached. Significant concepts in this philosophy are how we define truth (ontology) and the way we come to know or research truth (epistemology). Three important research philosophies are (Vreede, 1995; Malhotra, 1994):

Positivism

Positivism assumes that hypotheses derived from theories can be confirmed or disconfirmed through neutral observations. It generally refers to a strict empiricism that recognizes as valid only knowledge claims based on experience. Observed regularities and causal relationships shape an apprehensible, objective reality.

Relativism

Relativism asserts that there exists no single optimal 'scientific method' because it recognizes that there are multiple scientific objectives and alternative methods for constructing theory that are all equally valid. Relativism rejects the idea that science is capable of revealing the one and only reality, because a reality is relative to some particular system of expectations.

Interpretivism

Interpretivism believes that an understanding of the context in which any form of research is conducted, is critical to the interpretation of the data gathered. Interpretivists endeavor to describe, interpret, and understand situations from the perspective of the scientist. Interpretivist researchers construct interpretations or explanations that account for the way that subjective meanings are created and sustained in a particular setting. These findings allow multiple interpretations of truth, with weak or strong justifications.

The purpose of this research is to look for phenomena that can support or improve the knowledge sharing within organizations and strives to create a better understanding of the aspects which play a role in this process. Therefore we consider the most appropriate research approach follows the interpretive philosophy. Using this philosophy we will adhere to a critical 'common sense' in order to identify, investigate, and interpret causal relations between possible conditions and their effect on knowledge sharing.

2.3.2 Research strategy

The research strategy is the method to accomplish the research and defines the manner of data collection and analysis. It is based upon the nature of the problem to be studied, in relation to the underlying research philosophy, the primary objective of the research (i.e. the research goal), and the existing theory.

The nature of our research problem expects both a descriptive and prescriptive approach. According to Tsang (1997) the descriptive approach deals with the question "How *does*

knowledge sharing occur?" and the prescriptive approach asks "How *should* knowledge sharing occur?." The distinction is respectively between theory building and practical applicability (see Table 2.1 below).

	Descriptive approach	**Prescriptive approach**
Key question	How does knowledge sharing occur?	How should knowledge sharing occur?
Objective	Theory building	Improving organizational performance
Information source	Systematic data collection	Consulting experience
Methodology	Rigorous research methods	Case study research
Generalization	Aware of the factors limiting the generalizability of research results	Tendency to over generalize a theory to all types of organization
Outcome of learning	Potential behavioral change	Actual behavioral change

Table 2.1: Descriptive versus prescriptive approach (Tsang, 1997)

Construction of hypotheses in a research can be done in a deductive or in an inductive way (Baskerville, 2000):

deduction: this method of reasoning constructs a hypothesis from general or universal premises, from which a conclusion about particulars can be inferred;

induction: reasoning derives a generalized conclusion from observed particular instances.

The deductive approach is appropriate when the nature of the research problem is well understood. When only instances of knowledge are given and no general theory is available — like in our research problem — hypotheses should be derived from observations in reality (Baskerville, 2000). In our research strategy it is therefore rational to apply the inductive approach for theory building.

We assert that our research strategy employs interpretivism as its research philosophy and that it should cover both theoretical and practical aspects by adopting both a descriptive and a prescriptive approach. Moreover, the method of reasoning of this strategy ought to be inductive. Following Sol (1982), we conclude that the inductive-hypothetical model cycle fits the requirements of our research strategy:

- the model employed supports empirical studies, in line with our chosen interpretive research philosophy;
- it provides both descriptive and prescriptive research to accommodate theory building as well as theory utilization in practice, in agreement with our research strategy stipulations;
- consonant to our research strategy it uses the inductive way to construct and test hypotheses (conceptual and empirical models);
- the inductive-hypothetical model cycle accommodates an interdisciplinary research approach;
- it treats analysis and synthesis as interdependent activities to foster learning and knowledge sharing, a guiding principle of science in general and of this dissertation in particular.

The inductive-hypothetical model cycle (see Figure 2.1 on the next page) consists of five linked steps (Vreede, 1995):

Initiation
In this step the research problem is explored and rudimentary hypotheses are formed. These hypotheses are used to study a number of empirical situations related to knowledge sharing. The findings are described in a (number of) descriptive empirical model(s).

Abstraction
The second step builds on the first step. The key issues from the descriptive empirical model are abstracted into a descriptive conceptual model.

Theory formulation
This descriptive conceptual model forms the foundation for a prescriptive conceptual model. This model comprises the theory with which the research problem may be solved.

Implementation
The theory from the prescriptive conceptual model is implemented. A prescriptive empirical model is constructed to test and validate the theory.

Evaluation
This final step evaluates the prescriptive empirical model(s). Additional requirements for improving the prescriptive conceptual model may result, which can serve as an initial theory in another inductive-hypothetical model cycle.

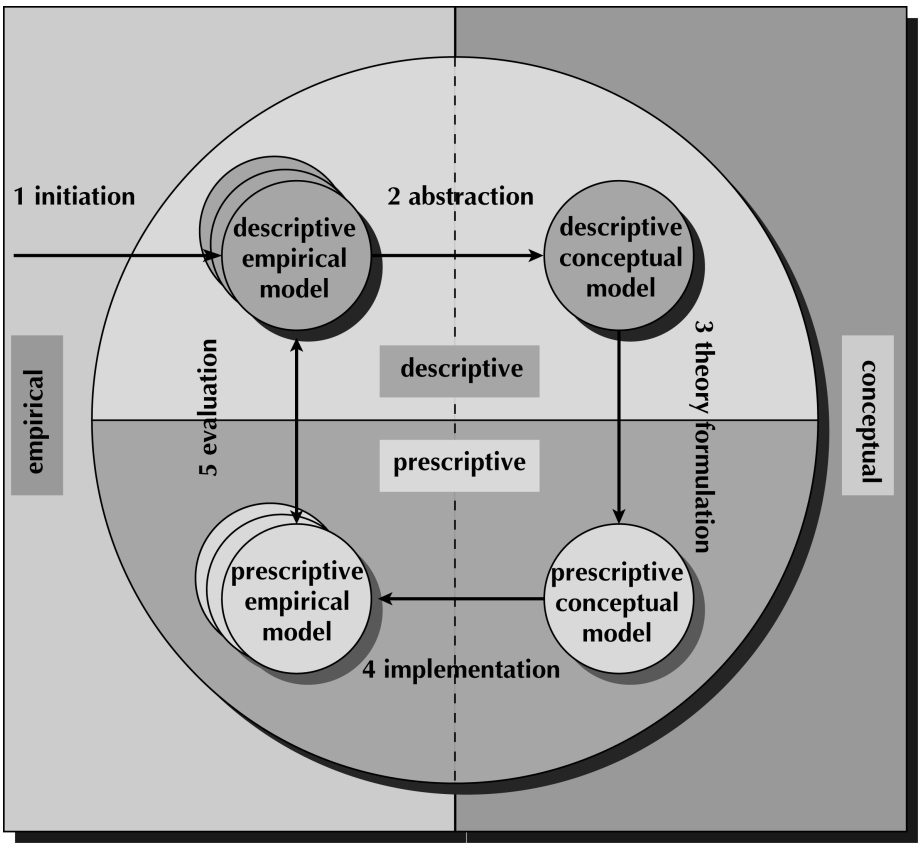


Figure 2.1: Inductive-hypothetical model cycle

2.3.3 Research instruments

Our research strategy outlined the method to accomplish the research goal. This section discusses the tools — the research instruments — necessary to implement that strategy. Some of the most used research instruments are (Vreede, 1995; Baskerville, 2000):

Laboratory experiment
The investigation of relations between controlled variables with minimum variations solving an artificial problem.

Field experiment
This is an experiment with a small number of uncontrolled variables that deals with a practical problem.

Case study
A case study is a planned and focused study of a phenomenon in its natural setting with a large number of variables (with only little or no control).

Action research
Action research is a study of relationships in the real world where the researcher is actively involved and has influence on the outcome of the study.

Survey
This is an investigation of a real-world situation at a particular point in time, usually utilizing a statistically analyzed questionnaire.

Theorem proof
Hypotheses are constructed using mathematical modeling based on a known set of derivation rules.

Simulation, role-playing, and gaming
Behavior is studied in a model of the real world with a limited set of controlled variables.

Forecasting
Extrapolation methods are used in order to deduce scenarios for the future.

Our research approach follows the interpretive philosophy and applies an inductive-hypothetical model cycle as its research strategy. The research instruments are chosen within this framework and they are selected to accomplish the research goal.

Theory is traditionally created by combining observations from previous literature, common sense, and experience (Eisenhardt, 1989). However, when there is not much known about a research problem or when the problem area undergoes constant change another perspective is needed. Because case studies do not rely on previous literature or prior empirical evidence it is argued that it is appropriate to use case study research in these situations — for capturing the knowledge of practitioners and developing theories from it (Benbasat et al., 1987; Eisenhardt, 1989). Therefore we choose case study research (a qualitative data source) as our research instrument.

Eisenhardt (1989) states: “The disadvantage of the case study as a research strategy is that investigators leap to conclusions based on limited data, or they sometimes inadvertently drop disconfirming evidence. The danger is that investigators reach premature and even false conclusions as a result of these information-processing biases. Thus, the key to good cross-case comparison is counteracting these tendencies by looking at the data in many divergent ways.” In order to avoid these disadvantages and to increase the ‘scientific rigor’ and applicability of our research we apply the following criteria of case study research (Voyer et al., 1996):

Internal validity
Internal validity stands for the credibility of the research. This research uses various qualitative data sources (interviews, observation) and employs research teams (peers from the author) for reviewing the produced material.

External validity

External validity means generalizability or transferability of the findings. This criterion is often not met in single case studies. Recommended is to research multiple cases. In this dissertation five cases of the 'real world' (with four quite different organizations as sites) have been selected to strengthen the generalizability of the study's results.

Construct validity

Construct validity regards the consistency and reliability of the research. The construct validity in this study is achieved through creating and contrasting multiple sources of evidence: literature, documents, archival records, direct observation, participant observation, and interviews.

Neutrality

Neutrality implies objective and confirmable research data. Subjective interpretations — the researcher's bias — of collected data are reduced by using various data sources and by applying the broad experience of the researcher with respect to interview techniques. Discussions in the research teams combined the subjective interpretations of their members to obtain a more objective view.

A case study research consists of the phases design and planning, collection, observation and analysis, and report (Eisenhardt, 1989). First the cases are selected using the following criteria:

- there is a growing need in the organization for connectivity and the synergy of information and knowledge;
- the organization perceives knowledge sharing as important;
- the sites are different enough by type, characteristics, and business processes to meet the criteria of external validity;
- it should be possible to gather the necessary data at the site and to become familiar with the characteristics of the situation.

Based on their need for connectivity of people and information systems and on basis of their perceived want for synergy of information and knowledge, we select the following case studies:

Getronics Consulting

Getronics Consulting is a consultancy firm located in the Netherlands, a member of the multinational Getronics Group, which specializes in issues related to organization and information & communication technology.

Royal Netherlands Air Force

Royal Netherlands Air Force (RNLAF) forms part of the Ministry of Defense of the Netherlands. The Royal Netherlands Air Force is responsible for delivering Dutch air power wherever needed.

Ministry of Housing, Spatial Planning, and the Environment

The Ministry of Housing, Spatial Planning, and the Environment of the Netherlands is responsible for coordinating environmental policy at government level to realize 'a permanent quality of the living environment'.

Unilever Research & Development Vlaardingen

Unilever Research & Development Vlaardingen is part of one of the principal companies in the world in the field of consumer goods for daily use, such as foods and products for home and personal care.

The next step is determining the data collection methods. Data collection at multiple cases with distinct characteristics should enable cross-case analysis and the extension of theory

(Benbasat et al., 1987). Our data collection is based on observations and participation at the sites as a long-term employee (about ten years) of this consultancy firm, as a project member (during a period of two and a half years) to implement a standardized information and communication technology infrastructure at Headquarters and all operational bases of the Royal Netherlands Air Force, and through conducting in-depth interviews at the Ministry and at Unilever Research & Development Vlaardingen.

We also employ qualitative data sources such as literature, documents, reports, business process descriptions, archives, own observations, and other interviews to obtain a rich image of the circumstances related to knowledge sharing. The data collected from the data sources is analyzed and compared on similarities, contradictions, and relations.

2.4 Research outline

As the first step in applying the inductive-hypothetical model cycle (as depicted in Figure 2.1 on page 15) in our research, we explore in Chapter 3 theoretical issues related to knowledge and knowledge sharing within an organization. Based on the knowledge creation theory of Nonaka and Takeuchi (1995) we define and discuss the processes involved in knowledge sharing in an organization. The model of Orlikowski (1992) — which treats the influences of and (often reciprocal) interactions between people, organization, and technology — is used to detail these knowledge sharing processes.

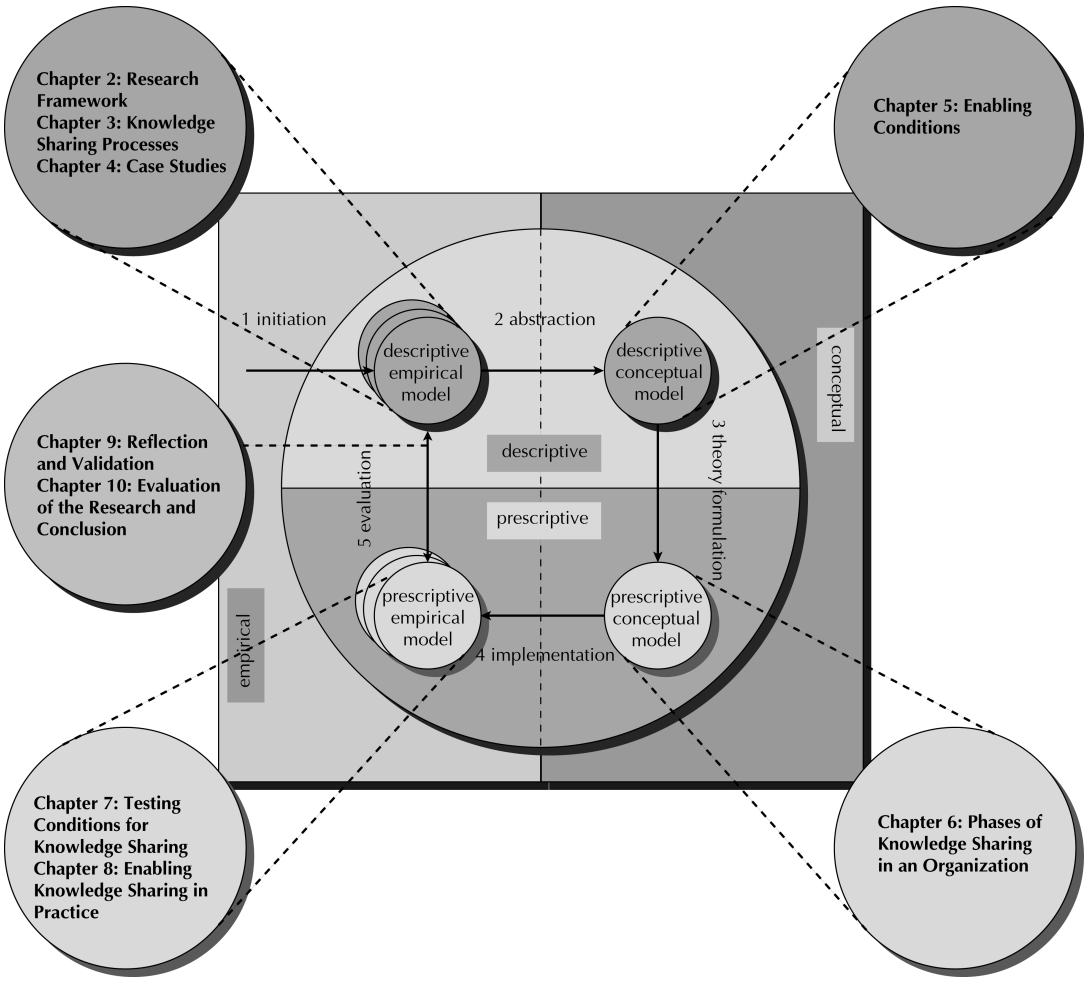


Figure 2.2: Research outline

In Chapter 4 this exploration forms the basis for the data collection, reflection, and analysis of two of the case studies which results in the descriptive empirical model: a matrix in which the knowledge sharing processes are related to the factors people, organization, and technology by means of describing conditions that may facilitate knowledge sharing.

The most significant issues of this model are abstracted to construct the descriptive conceptual model that is described in Chapter 5: this identifies the conditions and enablers for knowledge sharing, which are structured into social, organizational, and technological factors and related to the knowledge sharing processes. This model forms the foundation for the prescriptive conceptual model of Chapter 6. We use phases — that reflect a certain stage in the development of knowledge sharing in an organization — to refine our findings. We relate these different organizational phases to their most appropriate knowledge sharing conditions.

In Chapter 7 we define a repeating process of assessment and action to validate whether the (stimulation of the) identified conditions enable(s) knowledge sharing. Chapter 8 implements our model in three case studies (two new cases and one revisited). In Chapter 9 we reflect on our prescriptive empirical model and we address the validation of this model through expert interviews. The improvement of our model, resulting from these expert interviews, is also shown in this chapter. An evaluation and conclusion of our research is formulated in Chapter 10.

3 KNOWLEDGE SHARING PROCESSES

In times of change, learners inherit the earth,
while the learned find themselves beautifully equipped to deal with a world that no longer exists.
E. Hoffer

3.1 Introduction

This chapter is part of the first step — the initiation — of the inductive-hypothetical model cycle. We begin with an explanation of the knowledge creation theory by Nonaka and Takeuchi (1995): "human knowledge is created and expanded through the social interaction between tacit knowledge and explicit knowledge." Based on this theory we identify the processes that are related to knowledge sharing in an organization.

We also discuss the components people, organization, and technology of the model developed by Orlikowski (1992), because we consider these components as key factors in knowledge sharing. The theory of Orlikowski addresses the influences of these components and their reciprocal interactions.

The human factor in knowledge sharing is described by observing the drivers that trigger human action, the skill levels people may have, and the roles that people can play with respect to knowledge sharing in an organization. The organizational factor is addressed using the dimensions of an organization as defined in the 7S framework of McKinsey. We consider the relation between these organizational dimensions and the knowledge sharing processes. The technology factor is described through the possible functionalities of information and communication technology that can support knowledge sharing.

3.2 Knowledge creation through human action

After we emphasize in this section the individual character of knowledge, we discuss knowledge creation as a result of the interaction between tacit and explicit knowledge, and we elaborate on the notion of organizational learning.

3.2.1 Knowledge is personal and actionable

"Knowledge — the insights, understandings, and practical know-how that we all possess — is the fundamental resource that allows us to function intelligently" (Wiig, 1996). Through knowledge one can comprehend the world and communicate about it with other people.

We cited Davenport et al. (1998a) in Subsection 1.4.1 (on page 5) that "Knowledge is information combined with experience, context, interpretation, and reflection. It is a high-value form of information that is ready to apply to decisions and actions." In addition, Nonaka and Takeuchi (1995) assert that knowledge is about context specific and relational meaning, beliefs, mental models and commitment, and is actionable. Elliott (1996) underlines: "Knowledge for one person is just somebody else's information. Knowledge requires that there be somebody there who can use it — it is information in action. We have a lot of

information and data embedded in our organizations, but it is not knowledge unless a human being or group of people can add context to it and put it into use." Snowden (2002) argues that "language is our normal means of shared context, and the higher the level of abstraction [the less explanation is given due to familiarity with the subject of the conversation] the more effective the communication, but the smaller the audience."

We may conclude that knowledge is understood and interpreted from an individual understanding of the world and bears a more personal than universal character. This means that my knowledge not necessarily relates to your truth, but it does relate to my truth. Knowledge is regarded as "a dynamic human process of justifying personal belief toward the truth, the justified true belief" (Nonaka and Takeuchi, 1995).

3.2.2 Knowledge is tacit or explicit

We mentioned in Subsection 1.4.1 (on page 5) two main types of human knowledge: *explicit* and *tacit* knowledge. Nonaka and Takeuchi (1995) describe explicit or codified knowledge as that which "can be expressed in words and numbers and can be easily communicated and shared in the form of hard data, scientific formulae, codified procedures, or universal principles"; it can be written down, read, and talked about.

Tacit knowledge is intangible and described as knowledge that "is highly personal and hard to formalize. Subjective insights, intuitions, and hunches fall into this category of knowledge." It is rooted in human action, context-specific, and awkward to articulate or communicate. Tacit knowledge includes cognitive and technical elements and comes from the simultaneous engagement of mind and body in task performance (Nonaka and Takeuchi, 1995; Lent and Danko, 1997; Choo, 1995):

- cognitive elements include mental models, which refer to an individual's image of reality, beliefs of truth, and visions of the future that are based on experiences, schemata, paradigms, perspective, values, feelings, intuitions, and viewpoints;
- technical elements include concrete know-how, crafts, and hands-on skills.

The distinction is illuminated by Snowden (2002) as follows: "We can always know more than we can tell, and we will always tell more than we can write down." Tacit knowledge is more difficult to manage, but it should be the focus of knowledge sharing. Tacit knowledge is the organization's most valuable knowledge because it is considered as the critical source of creativity and innovation (Nonaka and Takeuchi, 1995). Some even define knowledge as wholly tacit and consider explicit knowledge to be mere information (Denning, 1998; Oldenkamp, 2001a).

3.2.3 Interaction between tacit and explicit knowledge of individuals

The sharing of knowledge takes place in social interaction among people (Nonaka and Takeuchi, 1995), which in turn influences their perceptions of reality and truth. This process of sharing implies communication of our knowledge and comprehension of the world through our language. Tenkasi and Boland (1996) observe: "We perceive nothing except through the meaning structures of our language in which perception and knowledge is embedded." Therefore the sharing of knowledge also demands a shared (but not necessarily equal) or understood perspective on the universe of discourse in order to attain

understanding of the language used. In this regard Tenkasi and Boland (1996) argue that knowledge sharing "requires an ongoing process of mutual perspective taking where individual knowledge and theories of meaning are surfaced, reflected on, exchanged, evaluated, and integrated with others in the organization." Dialogue, as used by Senge (1992), can be seen as an example of mutual perspective taking and moves beyond discussion. Dialogue allows the exploration of complex or difficult issues from many different perspectives and offers groups of people the possibility to share knowledge and to gain new insights.

Cross (2000) distinguishes four characteristics that influence effective knowledge sharing through social interaction: in knowing what other people know (the specific knowledge or way of thinking they can contribute to solve a problem), in having access to other people's thinking (are they accessible, able, and willing to share), in having people to actively engage in problem solving (do they try to understand the issue or do they offer solutions with little thought), and in having a safe relationship to promote learning and creativity (a certain degree of trust in the other person is requisite).

The dynamic model of knowledge creation, as presented by Nonaka and Takeuchi (1995), states that individual human knowledge is created and expanded through social interaction. Moreover, it lays emphasis on the key assumption that knowledge creation occurs through interaction between tacit knowledge and explicit knowledge, the so-called *knowledge conversion*. Tacit and explicit knowledge interact with and interchange into each other through the creative activities of people. Four conversion processes are defined for this interaction (see Table 3.1 below).

Conversion	**Conversion-mode**	**Interaction**	**Knowledge content**
Tacit-to-tacit	socialization	where people acquire new tacit knowledge directly from other people by sharing experiences	sympathized knowledge
Tacit-to-explicit	externalization	knowledge is externalized into tangible form through discourse: tacit knowledge is articulated in metaphors, stories, analogies, concepts, hypotheses or models	conceptual knowledge
Explicit-to-explicit	combination	combining different bodies of explicit knowledge, such as documents, may create new knowledge	systematic knowledge
Explicit-to-tacit	internalization	transfer of explicit knowledge into tacit knowledge takes place through "learning by doing" or when people internalize knowledge from explicit knowledge bodies like documents	operational knowledge

Table 3.1: Interaction between tacit and explicit knowledge (Nonaka and Takeuchi, 1995)

Nonaka and Takeuchi (1995) claim that each mode of knowledge conversion creates a different type of knowledge content. The product of socialization originates from sharing experiences and is called sympathized knowledge and can consist of shared mental models. Conceptual knowledge — because tacit knowledge is articulated into explicit

concepts — is generated in the externalization mode. Systemic knowledge — for systemizing concepts — is the product of the combination mode where explicit knowledge creates other explicit knowledge. Internalization creates operational knowledge about for example new production processes.

Nonaka and Takeuchi (1995) define a 'knowledge spiral' that progresses through the four modes of knowledge conversion — socialization, externalization, combination, and internalization — as follows (see Figure 3.1):

Socialization

The most difficult part of knowledge creation is sharing tacit knowledge, yet it is a key factor to make knowledge — which resides in the individual — available to the organization. After a common ground is established to enhance mutual trust and understanding, individuals may acquire new tacit knowledge directly from other people through for instance the sharing of experiences.

Examples of socialization are: master-craftsman apprenticeship relations, on-the-job training, copy and imitate, trial and error experiences, brainstorm sessions, co-operation teams with experienced and non-experienced employees, and job rotation.

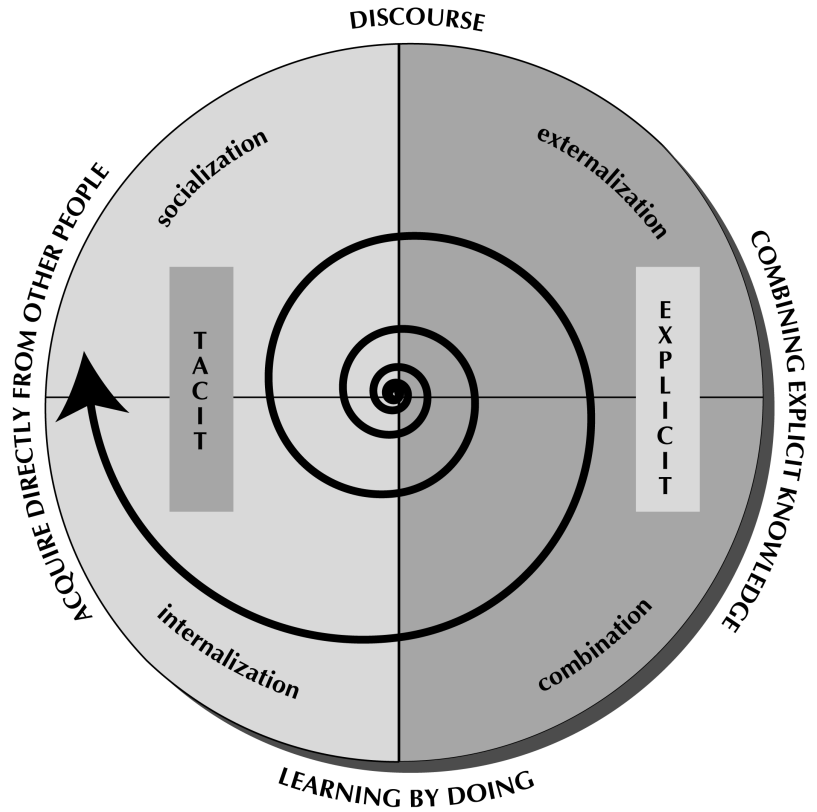


Figure 3.1: Knowledge conversion processes (Nonaka and Takeuchi, 1995)

Externalization

The next step is to make tacit knowledge explicit through metaphors, stories, images, concepts, hypotheses, models, and analogies. Tacit knowledge is expressed through dialogue or discourse in a creative way to stir the imagination so that the intuitive meaning can be interpreted or understood better. Externalization is of vital importance to organizational knowledge creation, because new explicit and tangible concepts are spawn from tacit knowledge.

Examples of externalization are: documentation of lessons learned, best practices, experiences, important decision-moments, outlined work processes and procedures, transfer of attended courses and seminars, Frequently Asked Questions, and threads in discussions- and mailings groups.

Combination

In the combination mode the newly created explicit knowledge is combined with existing knowledge in the organization, to create new bodies of explicit knowledge.

Examples of combination are: educational programs, (electronic) libraries, documented project results, manuals, Internet, and intranets.

Internalization

The fourth step amounts to internalizing explicit knowledge into tacit knowledge through a modified mental model or by operationalizing it through 'learning by doing' or prototyping.

An example of internalization is attunement of thinking and doing, like education tailored to the personal characteristics of an individual.

Organizational knowledge is, according to Nonaka and Takeuchi (1995), created by moving from individual tacit knowledge to explicit knowledge and back to individual tacit knowledge. This is a circular movement through the four knowledge conversion processes (see Figure 3.1 on page 24), whereby each step creates an increase in tacit or explicit knowledge: the so-called 'knowledge spiral'. In due course this knowledge spiral expands knowledge — tacit as well as explicit — at the individual, group, organizational, and inter-organizational level.

3.2.4 Organizational learning

Organizations learn in order to improve their adaptability and efficiency during times of change (Balasubramanian, 1996). Organizational learning builds on knowledge creation and sharing by individuals. Nonaka and Takeuchi (1995) suggest that learning at team, group, or organizational level "should be understood as a process that 'organizationally' amplifies the knowledge created by individuals and crystallizes it as a part of the knowledge network of the organization." Inkpen (1996) claims that individual knowledge should be shared throughout the organization to have impact on organizational effectiveness.

Fiol and Lyles (1985) state that "Organizational learning means the process of improving actions through better knowledge and understanding." Organizational learning may result in revised understanding, which may lead to different actions in the future. "The fundamental change is in cognition, not in observed actions" (Mason, 1993). As organizational learning does not need to result in immediate observable changes in organizational behavior (Huber, 1991; Mason, 1993), it can be defined as a process of gaining knowledge and developing skills to improve future organizational performance.

Senge (1990) claims that learning should go deeper than the ability to respond and adapt more effectively to change — which is about adaptation and coping. Organizational learning should also be generative and expand the capability of the organization — which is about creating. This distinction is also referred to as the difference between single loop and double loop learning or the difference between maintenance and growth versus transformation (Huber, 1991; Schein, 1996a). Adaptive learning or single loop learning solves problems by applying current concepts and skills in new ways without questioning

the validity of existing, underlying organizational values and norms. Miner and Mezias (1996) illustrate clearly the risk of this common applied type of learning: "gradual improvement of mechanical adding machines was a death trap for a firm that needed instead to learn how to compete in a world of electronic calculators." Generative learning or double loop learning "requires the learner to reframe, to develop new concepts and points of view, to cognitively re-define old categories and to change standards of judgment" (Schein, 1996). This type of learning requires the organization to create an organizational climate with appropriate processes that increases its capacity to deal with situations in new ways and create the possibility for developing new skills (Senge, 1990).

3.3 Knowledge sharing processes

The theory of Nonaka and Takeuchi — as described in the previous section — emphasizes knowledge creation. We combine existing literature to extend their theory to include also the management of codified or explicit knowledge. This results in the identification and description of the knowledge sharing processes (see Figure 3.2) that can occur in an organization (Skyrme, 1997; Bair, 1997; Davenport et al., 1998a; Davis, 1998; Spek and Spijkervet, 1996; Hendriks et al., 1997).

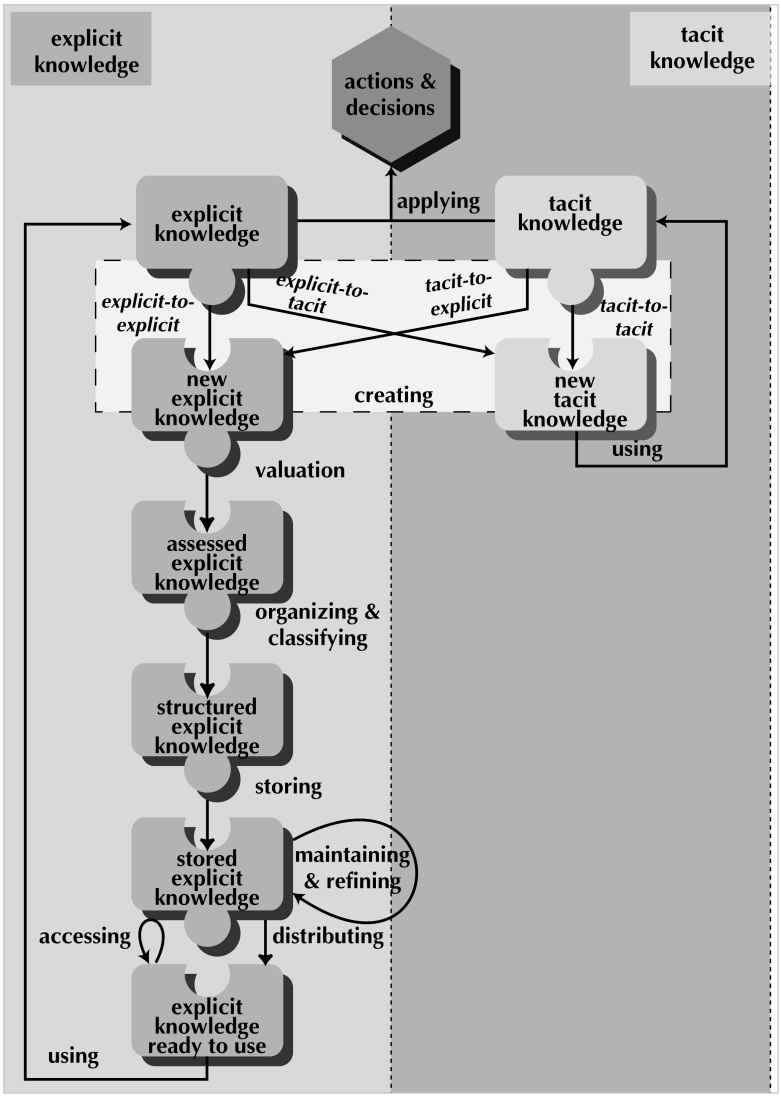


Figure 3.2: Knowledge sharing processes

The knowledge creation process is broken down into the four conversion modes as described in Subsection 3.2.3 (on page 22): tacit-to-tacit or socialization, tacit-to-explicit or externalization, explicit-to-explicit or combination, and explicit-to-tacit or internalization (Nonaka and Takeuchi, 1995), which results in new tacit knowledge and in new explicit knowledge. The new explicit knowledge is assessed on its possible value for the organization (is it congruent with the strategy) and its quality (is it accurate, comprehensive, timely, and available). If this results in a positive valuation, the new explicit knowledge is structured and classified (a classification scheme — like classification categories, taxonomies, indexes, tables of contents, and data models — enables retrieving or finding of knowledge components). Then this structured explicit knowledge is stored in knowledge repositories (like a database) for subsequent retrieval. The process of maintaining and refining knowledge removes out-of-date knowledge from the knowledge repositories and tries to improve the stored knowledge. The stored explicit knowledge can be accessed (pull-mechanism) or distributed (push-mechanism) to produce explicit knowledge ready to use.

In Table 3.2 below we list these processes and we illustrate the knowledge sharing that can take place through these processes.

Processes	**Knowledge sharing**
Creating knowledge / tacit-to-tacit	In this process knowledge is shared in social interaction through for example story telling that enables the transfer of complex tacit knowledge from one person to others.
Creating knowledge / tacit-to-explicit	Knowledge sharing can occur when people try to communicate their tacit knowledge to other people through for instance writing down their ideas and thoughts in theories.
Creating knowledge / explicit-to-explicit	When knowledge is written down in documents, it can be shared with other people. If they combine this with their own knowledge it may create new insights, which can materialize on paper.
Creating knowledge / explicit-to-tacit	People can acquire knowledge when an explanation about the rationale behind a document is given by another person.
Valuation of new explicit knowledge	Assessment of new explicit knowledge can result in its rejection, for example due to a perceived lack of applicability. Therefore, this knowledge will not become available for sharing with other people in the organization.
Organizing & classifying assessed explicit knowledge	The process of organizing and classifying enables locating needed knowledge. In Subsection 1.4.2 (on page 8) we put forward that "We view knowledge sharing as a process in which a person who seeks knowledge is linked to sources of knowledge and a transfer of knowledge takes place."
Storing structured explicit knowledge	Retrieval of stored knowledge implies combining of previous externalized knowledge with one's own knowledge.
Maintaining and refining stored explicit knowledge	The process of maintaining and refining stored knowledge improves knowledge sharing because it will focus on the knowledge that is considered the most valuable to the people in the organization.

Processes	Knowledge sharing
Distributing stored explicit knowledge	To distribute knowledge is to make it available to others.
Accessing stored explicit knowledge	The stored knowledge can be accessed, utilized, and shared by others.
Using explicit knowledge	Applying explicit knowledge can stimulate discussion among the bystanders about its quality and may lead to its improvement.
Using tacit knowledge	Using tacit knowledge in for example a dialogue may generate new knowledge in other people.

Table 3.2: Overview of knowledge sharing processes

In our research we relate these knowledge sharing processes with the components people, organization, and technology of the model constructed by Orlikowski (1992). These relationships may lead us to identify and understand the conditions that facilitate knowledge sharing between people in an organization.

3.4 People, organization and technology

We propose three entities as the key factors in knowledge sharing: people, organization, and technology. First, we regard knowledge sharing as a social interaction between people. Second, the organization is the environment in which knowledge sharing takes place. Third, (information and communication) technology is an important facilitator for knowledge sharing. In this respect Swan and Scarbrough (2002) argues that "the rationale for Knowledge Management calls for a variety of management practices, including the application of Information Technology but also the redesign of organizational routines and the development of Human Resource practices." In our study we consider people and social interaction as the focal point, where the organization is responsible for establishing the right conditions for knowledge sharing, and information and communication technology helps to facilitate this.

Orlikowski (1992) constructed a model to study influences and reciprocal interaction between people, technology, and organizations. Her theoretical model is composed of these three entities:

Human agents

Human agents are designers of — information and communication — technology, users of that technology, and decision-makers in an organization.

Technology

Technology is defined as material artifacts such as the software and hardware that people in organizations use in order to execute their task.

Institutional properties of organizations

These properties are identified by organizational characteristics. Orlikowski (1992) lists the following characteristics: "structural arrangements, business strategies, ideology, culture, control mechanisms, standard operating procedures, division of labor, expertise, communication patterns, as well as environmental pressures such as government regulation, competitive forces, vendor strategies, professional norms, state of knowledge about technology, and socio-economic conditions."

In her model, Orlikowski identifies four different influences (see Figure 3.3 below):

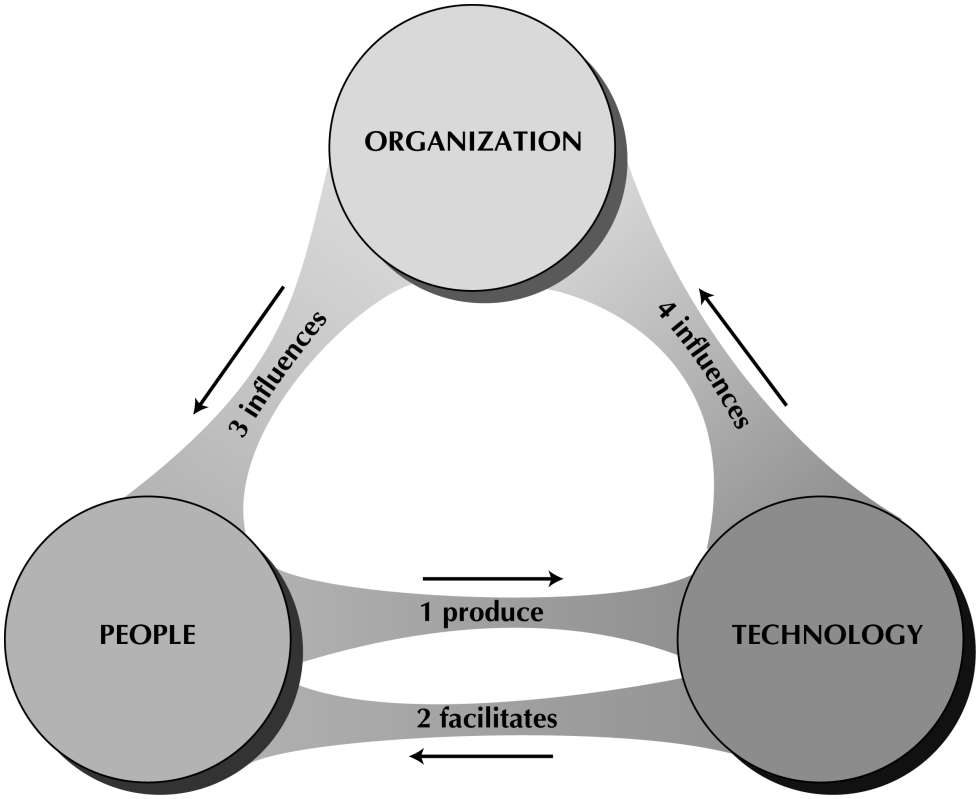


Figure 3.3: Model of Technology (Orlikowski, 1992)

1. Technology as a product of human action

People create and develop technology. This technology is deployed in organizations and maintained and adapted through human action. This utilization gives technology its meaning and influences task execution: "once created, technology is deployed in organizations but remains inanimate and hence ineffectual unless it is given meaning and is manipulated — directly or indirectly — by humans" (Orlikowski, 1992).

2. Technology as a medium of human action

Technology influences human action through facilitating — it supports accomplishment of tasks — and constraining — because it prescribes the manner in which a task should be executed. In relation to the organizational context and properties of the users, technology influences (but can not determine) social practices.

3. Institutional conditions of interaction with technology

Properties of the organization like values, norms, and practices influence people in their interaction with technology. Orlikowski (1992) observes that "Technology is built and used within certain social and historical circumstances and its form and functioning will bear the imprint of those conditions."

4. Institutional consequences of interaction with technology

The manner in which people use technology influences — in general unintentionally — the institutional properties of an organization, either by reinforcing or by transforming these properties. "When users conform to the technology's embedded rules and resources, they unwittingly sustain the institutional structures in which the technology is deployed. When users do not use the technology as it was intended, they may undermine and sometimes transform the embedded rules and resources, and hence the institutional context" (Orlikowski, 1992).

In her theory, Orlikowski draws on the structuration theory. Jaarsveld (2003) writes "this theory states that the basic domain of social science study is neither the experience of the individual, nor the existence of any form of societal totality, but social practices. Through social activities people reproduce the actions that make these practices possible. … The core of structuration theory lies in the concepts of structure, system, and duality of structure. Structuration refers to the conditions governing the continuity or transmutation of structures, and therefore the reproduction of social systems." Orlikowski (1992) states "structuration is posited as a social process that involves the reciprocal interaction of human actors and structural features of organizations. The theory of structuration recognizes that human actions are enabled and constrained by structures, yet that these structures are the result of previous actions." In this respect, Orlikowski (1992) argues "technology embodies and hence is an instantiation of some of the rules and resources constituting the structure of an organization. … Technology is created and changed by human action, yet it is also used by humans to accomplish some action." This notion is called the *duality of technology* (and shown as the first two influences in Figure 3.3 on page 29).

The interaction between technology, people, and organizations is recursively shaped by social processes, organizational structures, and by the — possibly technology supported — activities of employees in these organizations. This recursive relationship stems from the duality of these entities: "we shape tools that then shape us, or at least shape us through our use of them in particular ways … the social systems and the structural properties of these social systems are not 'out there', independent of us, but they are created every day through our thinking and through our actions" (Scharmer, 1999). Let us illustrate this recursive relationship by using e-mail as an example of technology. Orlikowski (1992) reasons that "a company's adoption of electronic mail may have the intended consequence of increasing communication and information sharing, and the unintended consequence of reducing status barriers and social context cues" and she "describes how users of an electronic mail system employed different strategies for using it based on their different task contingencies and individual preferences. As a result, the technology was appropriated in diverse ways and came to have different meanings and effects for different users."

Scharmer (1999) denotes that "in understanding how we create and recreate our structures there's the possibility for changing them. … [This implies trying] to understand the conditions that allow it to shape or influence or to change the direction."

In the following sections of this chapter we will analyze the entities of Orlikowski's model — people, organization, and technology — and their interaction, to define which attributes of these entities can help to identify the conditions that facilitate knowledge sharing. However, the particular organizational context bears a major influence on the exact relationships between people, organization, and technology. Therefore, no universal or rigid truth will exist about knowledge sharing triggers. However, we remark that in this respect we view reality as more 'makable' than probably Mrs. Orlikowski does. In our opinion stimuli do exist and they will have their effect, although it is hard to predict the exact result.

3.5 The human factor

Davis (1998) states that "Effective knowledge management requires a fundamental change in the way most companies do business, and people are at the heart of any effective

change." This section addresses the human factor in knowledge sharing: it discusses the drivers that trigger people to do what they do; it identifies the possible skill levels of a person, and it defines the roles an individual can play in an organization.

3.5.1 Drivers for human action

In Subsection 3.2.3 (on page 22) we cited the fundamental assumption of the theory by Nonaka and Takeuchi (1995) that human knowledge is created and expanded through social interaction between people and their creative activities. It is obvious that the role of people in contributing their knowledge and using other people´s knowledge is vital to knowledge sharing; but, what drives an individual?

We regard the motivation of a person as influenced by the characteristics of that individual, the situation, and their interaction. According to the theory of Maslow (1968) the behavior of people is determined by five needs, which can be visualized as a pyramid. The 'animal' or physical needs are located at the base, and the human needs at the top. Maslow claims that these needs have a hierarchical order and the needs of the next level will only become relevant for an individual when the needs of the current level have been satisfied sufficiently (like for instance a person who is starving has only food on his or her mind).

Maslow (1968) defines this Hierarchy of Needs as follows:

Physiological needs
: Biological needs such as oxygen, food, water, warmth, coolness, sleep, protection from storms and so forth. These needs are the strongest because these needs are necessary for staying alive.

Safety needs
: These are the needs for safety, security, and protection.

Social needs
: The social needs relate to social contact, escaping loneliness and alienation, giving (and receiving) love and affection, and a sense of belonging.

Esteem needs
: These are needs for recognition and respect from others, for esteem and status in relation to self-respect.

Self-actualization needs
: The needs for self-development and personal growth can be considered as an ongoing process to become a better human being.

The key principle of Maslow's theory is that deprivation of needs leads to action. When a need is unfulfilled, an individual will take action to have that need satisfied. The strength of this action is dependent on the degree of deprivation.

Besides the needs of an individual the characteristics of the situation influence the motivation of that individual as well. People also behave according to their experiences in the past — reward and punishment leads to conditioning. The characteristics of a situation act as (perhaps subconscious) stimuli for the behavior that is related to the needs felt at the time.

Conditions can be created affecting the needs and the characteristics of the situation in order to influence motivation of individuals. These conditions can thus be used to encourage certain types of behavior and repress others. For instance, the social interaction needed

for knowledge sharing can only take place when people value building on each other's thoughts and are willing to share their own insights. If no conditions exist that stimulate such interaction, people will have no strong motivation to share knowledge: there are no stimuli to change a person´s behavior in this direction.

According to Jones and George (1998) other important drivers for human action in knowledge sharing — next to motivation — are: values (which serve as guiding principles), attitude (which carries an evaluative character of a relation), moods and emotions (which shows how a person feels), and trust (which expresses confidence).

Values

Jones and George (1998) observe: "Values are general standards or principles that are considered intrinsically desirable ends, such as loyalty, helpfulness, fairness, predictability, reliability, honesty, responsibility, integrity, competence, consistency, and openness." These values function as guiding principles in a person's life and influence behavior because they separate desirable from undesirable behavior.

Attitude

Attitudes can be defined as: "(1) the knowledge structures containing the specific thoughts and feelings people have about other people, groups, or organizations and (2) the means through which people define and structure their interactions with others" (Jones and George, 1998). Attitude is derived from a person's values, but it can influence the value system over time.

Moods and emotions

Jones and George (1998) write that "Moods and emotions capture how people feel as they go about their daily activities, including interacting with other people; they are affective states or feelings that provide people with information about their ongoing experiences and their general state of being. The intensity of the affective state is a primary distinguishing feature between moods and emotions. Emotions are intense affective states that interrupt ongoing cognitive processes and behaviors and are tied to particular events or circumstances, whereas moods are less intense, pervasive, and generalized affective states that are not explicitly linked to particular events or circumstances." Moods and emotions are more volatile than attitudes.

Trust

Trust can be viewed as "an expression of confidence between the parties in an exchange of some kind — confidence that they will not be harmed or put at risk by the actions of the other party or confidence that no party to the exchange will exploit the other's vulnerability" (Jones and George, 1998). Trust is an important factor in human - human interaction and may prove to be a critical factor for knowledge sharing.

Our mental model is another concept that is related to the motivation of a person. The perception of a situation is filtered through our mental model, which can be seen as "the vehicle through which experience is structured and information acquisition facilitated" (Leidner and Elam, 1995). Senge (1990) claims: "These mental pictures of how the world works have a significant influence on how we perceive problems and opportunities, identify courses of action, and make choices." We observe that mental models also affect knowledge creation and sharing (and what we learn influences — over time — our mental models).

3.5.2 Skill levels and roles

People in an organization function at certain skill levels, depending on experience, interests, task complexity, and productivity. Senge (1999) recognizes the following skill levels — listed in increasing order of knowing how to cope with a changed environment: trainee, amateur, professional, specialist, and expert.

Trainee
Trainees learn by following existing rules and procedures. Their understanding is mainly rational and intuition plays a minor role.

Amateur
Amateurs have a grip on the studied theory. They are capable of understanding regular, routine processes and learn from there.

Professional
Professionals know the ins and outs of the subject matter. Professionals are learning the finer details and are able to cope — autonomous — with small adaptations.

Specialist
A specialist has experienced many different situations that build his or her extensive skills. Specialists can handle even the most exotic circumstance.

Expert
Experts possess all knowledge to the full. They use and can rely on their intuition to deal with a situation.

The distinction in skill levels may help enabling the process of knowledge sharing within an organization. Knowledge sharing can be tailored to the skill levels of the people involved: knowledge transfer between a professional and an amateur may be more fruitful than between an expert and a trainee — because their level of understanding does not differ too much. In addition, the distinction may help in finding the right counselor. It can also support in establishing the responsibilities a person has in knowledge sharing — an expert will play a larger role as compared to a trainee because more people can benefit from his or her knowledge.

Not only a person's individual characteristics and his or her skill level are important elements in knowledge sharing, but knowledge sharing is also influenced by the (functional) role a person has in the organization. Nonaka and Takeuchi (1995) claim that "Creating new knowledge in the knowledge-creating company requires the participation of front-line employees, middle managers, and top managers. Indeed, the value of any one person's contribution is determined less by his or her location in the organizational hierarchy than by the importance of the information she or he provides to the entire knowledge-creating system." Davis (1998) distinguishes four distinct roles that are directly related to knowledge sharing in an organization: knowledge users, the line knowledge manager, the competency knowledge manager, and the chief knowledge officer.

Knowledge users
The role of the average knowledge user is focused on effective contribution and usage of knowledge. Knowledge users may use automated tools to find and access knowledge components and the knowledge user provides feedback on the classification and content of the knowledge repositories.

The line knowledge manager
A line manager has a responsibility for knowledge management within his or her organizational unit: he or she makes an initial valuation of the outcomes of daily business and decides if such a result could be a new knowledge component. If so, the line knowledge

manager organizes and classifies this knowledge component. In addition he or she implements the procedures, policies, and reward systems developed by the competency knowledge managers.

The competency knowledge manager

A competency knowledge manager defines and develops procedures, policies, and reward systems that encourage knowledge sharing across organizational boundaries for a certain area of know-how. These employees create and maintain the classification structure for each recognized competency. A competency knowledge manager searches for new knowledge components within his or her competency scope (through for instance monitoring electronic discussion groups, through research, or through a focused search on for example best practices), valuates, organizes, and classifies them. A competency knowledge manager maintains and refines existing knowledge components and distributes them.

The chief knowledge officer

"The chief knowledge officer is responsible for the overall knowledge assets of a company" according to Davis (1998). Based on the strategy of the organization he or she defines which knowledge areas are relevant. The chief knowledge officer is ultimately responsible for the organization-wide classification structure of knowledge components and resolves cross-competencies issues. At the same time the chief knowledge officer secures the availability of an appropriate technology infrastructure.

3.6 The organizational factor

This section details in what way an organization — the second entity of the model of Orlikowski (1992) — can influence the knowledge sharing process. The first section describes possible dimensions of an organization — according to the 7S framework of McKinsey — which we will use to analyze organizations. The final part of the section addresses the culture of an organization because existing literature suggests that culture plays an important part in knowledge sharing.

3.6.1 Dimensions of an organization

In this section we will look into organizational dimensions and their relevance for knowledge sharing. A well-known model to characterize and analyze organizations is the 7S framework by McKinsey (see Figure 3.4 on page 35). This model enables us to look at an organization from multiple, related perspectives in order to form an integral perspective. The model consists of seven organizational factors: strategy, structure, systems, staff, skills, style, and shared values. These factors are related, interact, and should be aligned. A limitation of this model is that this desired alignment may also hamper change. An extra factor that focuses on the external, competitive environment would perhaps have resolved this weakness. Besides, a model is a simplified view of the real world. Therefore, in our research we use the 7S framework primary as a checklist to look at an organization.

Strategy

This factor addresses the mission (raison d'être), vision (long term goal), and strategy (how do we accomplish this vision) of an organization. A learning organization is defined by Garvin (1993) as "an organization skilled at creating, acquiring, and transferring knowledge, and at modifying its behavior to reflect new knowledge and in-

sights." Such an organization is aware of the potential value of knowledge, and defines and executes a strategy in which knowledge sharing plays a key role. The strategy for knowledge sharing builds on the business strategy and should make clear in what way knowledge sharing in the organization can add value externally and internally. Defining the knowledge sharing strategy in relation to the business strategy may be guided by the characteristics of the products or services of the organization (Hansen et al., 1999). If the products and services are standard or mature and do not vary much the strategy should focus on elaborate storage and easy access of explicit knowledge (documentation, archives, and databases) — we will term this the explicit oriented knowledge sharing or codification strategy. If an organization sells customized, unique, or innovative products and services, knowledge about those products or services does not have a high re-usage value or becomes out of date quickly. Such an organization should consider offering easy access to specialists and experts because people need to share information that would get lost if it had been codified — we will call this the tacit oriented knowledge sharing or personalization strategy.

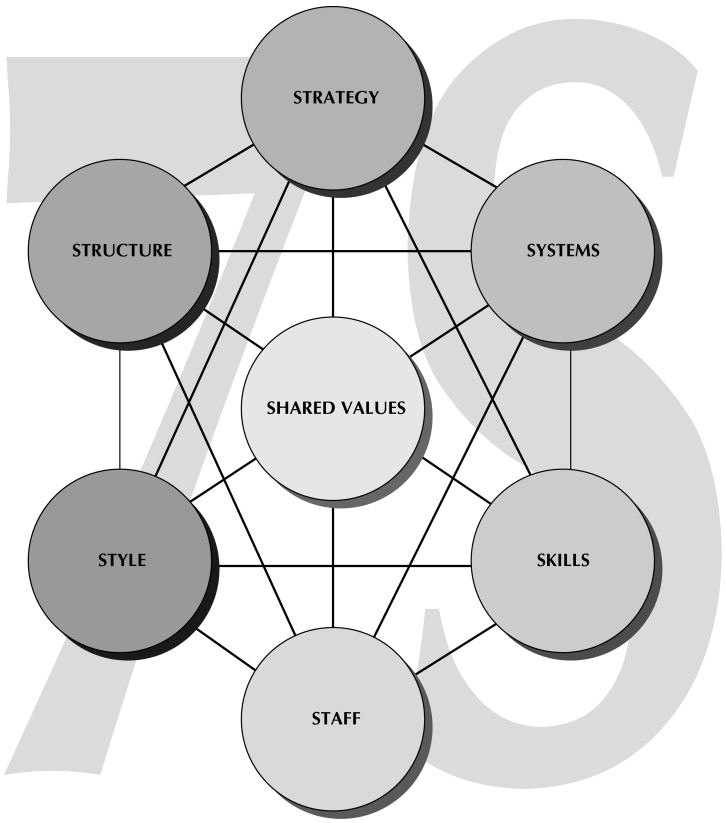


Figure 3.4: 7S Framework (McKinsey)

Structure

Structure defines the way in which tasks, responsibilities, coordination, and communication flows are organized. The organizational structure ought to be focused on stimulating the knowledge sharing between people and teams. It may help if a learning organization has a flat hierarchical, networked structure with a focus on teams composed of people with heterogeneous backgrounds and who can act with a high degree of autonomy (empowered employees). Glynn (1996) and Stebbins and Shani (1998) assert that the right organizational structure for knowledge sharing tends to be organic rather than mechanistic in structure (because this structure is able to deal with greater amounts of uncertainty), integrative rather than segmentalist (the synthesis of different points of

view is increased), team-based rather than individual worker organized (offers extended opportunity for feedback and error correction), and are flexible environments with: lower formalization, smaller organizational size, more role ambiguity, broad job definitions, job autonomy or self-management, multidisciplinary teams, interlinked business units, and job rotation.

Systems

Systems comprise the compilation of procedures and directives that facilitate the business processes and activities. In a learning organization, systems should stimulate and help to communicate, coordinate, and collaborate (as many systems are realized through information and communication technology, we also refer to Section 3.7: the technology factor).

Staff

Staff defines the different types of people, their demographics (for example sex, age, and education), their motivation, skill levels, and roles (which we detailed in Section 3.5: the human factor). The employees of a learning organization should be open to change, positive to teamwork, and willing to share and use knowledge.

Skills

The factor skill refers to competences of people (see Subsection 3.5.2 for a discussion on skill levels). Specific skills related to knowledge sharing are the techniques of dialogue and discussion.

Style

Style indicates the patterns of behavior characteristic for topmanagement of the organization: the leadership style. In a learning organization topmanagement plays an important role in knowledge sharing because they should set an example of the needed behavior and ought to stimulate and facilitate — on a continuous basis — the profound and deep change needed in the ways of working of the learning organization.

Shared values

Shared values or culture are the shared beliefs and assumptions — imposed by the values, norms, and practices of the organization (we refer to Subsection 3.6.2 where we extensively address the concept of culture) — organizational members use to guide their actions and attach meaning to events (Landry, 1992). The culture of a learning organization is open and strongly encourages knowledge sharing.

These seven factors are divided in *hard* factors: strategy, structure, and systems and *soft* factors: staff, skills, style, and shared values. The hard factors of the 7S framework (like information and communication technology systems) are important, but the soft factors like staff and their motivation are considered critical for knowledge sharing (Weggeman, 1997; Davenport et al., 1998a).

3.6.2 Values, norms, practices and organizational climate

One of those soft factors mentioned above is shared values or culture. Existing literature suggests that culture plays an influential role in knowledge sharing (Bair, 1997; Darling, 1996; O'Dell and Jackson Grayson, 1997; Elliott, 1997a; Fiol and Lyles, 1985; Gephart et al., 1996; Knapp and Yu, 1999; Schein, 1996a; Trussler, 1998). Schein (1996b) defines shared values as follows: "A culture is a set of basic tacit assumptions about how the world is and ought to be that a group of people share and that determines their perceptions, thoughts, feelings, and, to some degree, their overt behavior." Culture is based on shared

history, expectations, unwritten rules, and social mores that influences organizational behavior. Long (1997) describes an organizational culture in values, norms, and practices:

Values

"Values indicate what an organization's members believe is worth doing or having" (Long, 1997). Values truly influence behavior in an organization, although never actually articulated, and serve as a guiding principle to the vision of the organization.

Norms

Norms are formulated by Long (1997) as "the shared beliefs about how people in the organization should behave, or what they should do to accomplish their work." They are of an expecting character and cause a distinction between desirable and undesirable behavior.

Practices

"Practices are the formal or informal routines used in the organization to accomplish work", according to Long (1997). Formal as well as informal practices are the business activities that are performed (and which often are visible to other people) under specific roles, procedures, and directives.

In spite of the fact that culture is deemed important to knowledge sharing, two disadvantages are present: culture is not a tangible concept, and, in general, it is felt that changing the culture of an organization will take considerable time and effort (Long, 1997; Weggeman, 1997). Schein (1996a) observes that "Cultural assumptions provide stability and meaning to our daily life. They structure our perceptions and thoughts, and they tell us how to evaluate and feel about things. It follows, therefore, that if some of those assumptions need to change because they are out of line with new data about the external or internal environment, such change will be preceded by a period of anxiety, and that anxiety will produce denial and various other kinds of defensive resistance to change."

Our research tries to translate the notion of culture — with respect to knowledge sharing — into more concrete terms through the identification of enabling conditions. This may serve as a handle to change organizational culture in a way conducive to knowledge sharing.

3.7 The technology factor

This section addresses the third entity of Orlikowski's model: technology, and the potentialities of technology to support knowledge sharing. This section starts with an introduction about the key supportive role that information and communication technology can play in the knowledge sharing process. The other section describes the possible functionalities of information and communication technology.

3.7.1 Information and communication technology as key support

Notwithstanding a possible overestimation of or too narrow a focus on developments in technology, these do tend to create possibilities for the advancement of society and of people. Yarza Luaces (2002) explains that "It was they [Flemish painters in the late 15th and early 16th Century] more than anyone else who revolutionized the painting of their times by perfecting the use of oils, an advance that had profound and lasting consequences for the finished work by making possible the use of color tones of such purity and intensity — that astonishing light effects, hitherto impossible, became part of their stock in trade."

Nosek (1996) argues that "Organizational work increasingly demands the completion of complex tasks by distributed teams, i.e., the necessary skills may be distributed across the department, organization, country, or the globe. In addition to team location and their mobility, the work of teams varies across phases of the project and character of the task. Sometimes there is intense collaboration requiring immediate feedback, sometimes work is sequential, such as iterative refinement of a document, while other times it can be mostly individual work that is coordinated or collated. Information and communication technology can provide effective and efficient any-time, any-place group support technologies for teams engaged in the completion of complex tasks." The application of information and communication technology considerably extends the reach of knowledge, needed to accomplish these complex tasks. Increasing possibilities and lower costs of communications and computing create new opportunities to share knowledge between more people, at more locations, and with less expense.

Following Orlikowski (1992) we define technology in this dissertation as the software and hardware that people in organizations use in order to execute their task: the information and communication technology. Information and communication technology progresses according to Keen (1993) "from being an important but separate element of business management to being at the core of everyday business and social life." Change is radical, fast, and not predictable. This demands technology to put "emphasis on precognition and adaptation in contrast to the traditional emphasis on optimization based on prediction" and to facilitate "a faster cycle of knowledge-creation and action based on the new knowledge" (Malhotra, 1997).

The nature of technology will shift from emphasis on what goes on *inside* an organization to emphasis on events and conditions that occur *outside* the organization. The role of information and communication technology will expand from transaction processing to the support of information and knowledge sharing and moves from supporting pure computational activities towards supporting coordination activities, facilitation of interpersonal and group communication (people networks), and provide means for collaboration, thereby removing barriers of time and location (Keen, 1993; Malhotra, 1997).

Alavi and Leidner (1999) argue that "Traditionally, knowledge creation and transfer has occurred through various means such as face-to-face interactions (planned or ad hoc), mentoring, job rotation, and staff development. However, as markets and organizations become more global and move to virtual forms, these traditional means may prove to be too slow and less effective and in need of being supplemented by more efficient electronic means." Anderson (1997) suggests that people will work in "an interconnected environment supporting communication, collaboration, and information sharing within and among office and non-office work activities — both within and among enterprises; with office systems, groupware, and intranets providing the bonding glue." A first step to attain such an interconnected environment is to have information and explicit knowledge components online, indexed and mapped, so people can see what is available and can find it. An example of this technology is an intranet containing digitally stored documents and/or online 'yellow pages' (a navigational aid to identify people by expertise, community, skills, interests, and affiliation: Bair, 1997). A second step supports communication between people, assists in the use of best practices to guide future behavior, and enables the sharing of ideas. Examples are e-mail, bulletin boards, and discussion databases. The third step amounts to facilitating shared creation and capturing of tacit knowledge in for instance communities of practice ("informal networks of people who do the same or similar kinds of work": Manville

and Foote, 1996; their members share common practices, interests, or aims), interest groups, or competency centers. Examples of this technology are groupware, electronic conferencing, screen sharing, application sharing, and electronic whiteboards in which multimedia, interactive, and animation techniques can be applied. In the forth step technology offers a virtual space in which a team can collaborate interactively, irrespective of geographic distribution of the team members or time. Anderson (1997) believes that the virtual or shared space "moves users further into the substitution for 'being there' by enabling them to 'be somewhere else' together." An example of this technology is a networked virtual environment.

3.7.2 Supportive functionalities

A major objective of information and communication technology in facilitating knowledge sharing is to connect people with other people or with explicit knowledge. The methods and techniques applied need to be capable of supporting all the necessary functions and activities of the working environment of the knowledge worker (Skyrme, 1997). Therefore an information and communication technology infrastructure is needed that supports the creation, structuring, accessing, and using of knowledge. This infrastructure can consist of three, related dimensions. One dimension is to have information and explicit knowledge components online, indexed and mapped, with easy access and accurate retrieval for all users — in this situation the emphasis is put on explicit knowledge. Another dimension is to improve coordination, communication, and collaboration between people, teams, or groups to transfer the knowledge from those who possess this to people who need or can use this (McGee and Prusak, 1996) — here the emphasis is on tacit knowledge. The third dimension is to offer pointers to people with a special expertise or to documents that describe knowledge — in this dimension the emphasis is on both tacit and explicit knowledge.

Anderson and Smith (1998) segment functionalities of information and communication technology that could support knowledge sharing as follows:

Office applications
: This segment covers the basal functionality of office systems in an organization like basic communication and productivity support for employees (examples are e-mail and messaging, calendaring and scheduling, and personal productivity applications).

Groupware
: Groupware facilitates group work and collaboration. It provides technological support for cooperative work (examples are discussion databases, application sharing, and electronic meeting systems).

Document systems
: This functionality offers support for document creation, storage, and life cycle management whereby paper-based documents are increasingly being replaced by digital documents.

Work process systems
: This information and communication technology assists and monitors the execution of the workflow and the (interaction of the) related work processes. Examples are workflow management systems, process support systems, and e-forms.

Analytical systems
Analytical systems support analysis and interpretation of structured data for operational and strategic planning and decision-making (examples are decision support systems and data warehouses).

Knowledge systems
This functionality facilitates information retrieval (through for instance intranets or portals), online learning, and knowledge sharing.

Information and communication technology tools that can realize those functionalities are detailed and related to the knowledge sharing processes in Appendix C (on page 215).

3.8 Conclusion

In this chapter we created a foundation to analyze (the conditions that enable) knowledge sharing. We identified and presented the knowledge sharing processes that can occur in an organization. We also defined three entities as the key factors in knowledge sharing: people, organization, and technology.

When we associate the identified knowledge sharing processes with the entities people, organization, and technology we observe that the four processes to create knowledge are based on interaction between people and on consultation of codified knowledge by persons. These processes will be influenced for instance by the attitude of people. An organization can probably manipulate these attitudes for example by creating a proper organizational climate that enables social interaction. Information and communication technology can aid this interaction through tools like an electronic discussion forum or an intranet. The four processes that manipulate explicit knowledge will be affected by the skill level of the employees that operate on this explicit knowledge. Educational programs initiated by the organization will have a bearing on these skill levels, and may take on the form of computer based training. The two knowledge sharing processes that offer access to or distribute explicit knowledge enable the sharing of codified knowledge with other people. We suggest that the organization may influence the susceptibility of people to this knowledge by ensuring its quality. Technology can facilitate the communication flows involved, irrespective of time and place. The two processes that use knowledge are strongly influenced by the competency of the people how to use the knowledge. We suppose that an organization can develop these competencies through human resource management and that progress can be monitored in competence management systems.

In the next chapter we will use these findings to analyze two of our case studies with respect to knowledge sharing. This will enable us to construct our descriptive empirical model, in which the knowledge sharing processes are related to the entities people, organization, and technology.

4 CASE STUDIES

And between your knowledge and your understanding,
there is a secret path.
K. Gibran

4.1 Introduction

In the previous chapter we discussed the knowledge sharing processes (see Subsection 3.2.4 on page 25) and the influence or support human, organizational, and technological entities may have on knowledge sharing in an organization (see Sections 3.5, 3.6, and 3.7 respectively). This chapter assesses through two of our case studies — and consistent with the validity criteria that we described in Subsection 2.3.3 (on page 15) — in what way these findings may hold in practice. This analysis concludes the initiation step of the inductive-hypothetical model cycle, and results in our descriptive empirical model.

As we mentioned in Chapter 2: the case studies are selected on their need for connectivity of people and systems and on basis of their perceived want for synergy of information and knowledge. In this chapter we study two cases — a consultancy firm and the national air force of the Netherlands — that have rather different characteristics and (profit / not-for-profit) organizational processes that allow us to study the practice of knowledge sharing from distinctive angles.

The researcher was until recently a long-term employee (more than 10 years) of this consultancy firm — Getronics Consulting — and was closely related with knowledge sharing initiatives within this organization. This enabled the researcher to gather the necessary data for this case. Data from the other case — the Royal Netherlands Air Force — has been collected during a period of two and a half years in which the researcher acted as a project member in a large scale operation to implement a standardized, nationwide, safe, and reliable information and communication technology infrastructure at Headquarters and all operational bases in order to connect people with each other electronically.

Next to data collection based on observations and participation at the site, data is also gathered by employing qualitative data sources such as literature, documents, reports, minutes, business process descriptions, archives, and interviews to obtain a rich image of the circumstances related to knowledge sharing as present in the case studies.

The methodological theme of these two case studies is to examine the conditions and enablers for knowledge sharing in practice, based on the findings of the preceding chapter. There we defined the processes involved in knowledge sharing (which builds on the knowledge creation theory of Nonaka and Takeuchi, 1995), that we analyzed using the influences of and interactions between people, organization, and technology (as shaped by the theory of Orlikowski, 1992). The study of these two cases is carried out with the intent to lay the foundation for the development of the descriptive conceptual model (which is described in the next chapter on page 65).

4.2 Case 1: Getronics Consulting

4.2.1 Description

Getronics Consulting is a Dutch consultancy firm, part of the multinational Getronics Group with approximately 34.000 employees and operations in more than 130 countries. The Getronics Group is one of the world's leading providers of information and communication technology solutions and services that help our clients to address and improve their customer interaction and infrastructure. Services of the Getronics Group are consulting, designing, implementing, maintaining, and managing systems that combine state of the art technology from all major vendors, thereby delivering worldwide independent solutions that want to meet the customers' needs.

The Getronics approach to consultancy services is designed to cope with the complexity of business change. Getronics Consulting (550 employees) offers strategic consultancy and program management services to help organizations to choose and invest in new technologies, implement organizational changes, or overhaul business processes. Information and communication technology solutions are customized in accordance with the clients' business situation or to ensure that an organization is change ready and able to respond to changes in the marketplace, customer base, and competition. These solutions are obviously influenced by the complexity and pace of change of the society, and have to fit in with the people, business processes, and technological infrastructure that exist in the organization of the customer.

The services of Getronics Consulting include:

- strategy and policy development;
- interim management;
- project- and program management;
- change management: design and re-design of business functions, -processes, -activities and/or procedures and implementing these changes;
- strategy, policy, and staffing consultation for information & communication technology departments;
- defining, introducing, and realizing information architecture;
- evaluation of information & communication technology and telecom infrastructures;
- financial analyses of information & communication technology and telecom assets;
- education and training;
- software package selection, application introduction, and implementation.

Customers of Getronics Consulting operate in sectors such as financial services, trade, industry, government, public, health care, telecommunications, media, and commercial services.

4.2.2 Way of working

New assignments are mainly acquired by account managers, sometimes the consultants obtain an assignment through their personal network, and in a few cases assignments are secured by tender. For the most part these assignments can be qualified as detachment work, i.e. labor capacity (of the consultant) is rented by the hour to the client. Occasionally

assignments qualify as true consultancy work, i.e. they provide a client with a solution to his or her problem.

The consultant that will carry out an assignment is selected on several aspects: which consultants are available, what are their experiences and skill levels, is their hourly tariff acceptable, and do their personalities and type of behavior fit in with the organization of the customer? The curriculum vitae of two or three selected candidates is sent to the client, who selects some of them for an intake.

Habitually assignments are performed autonomous and self-supporting, usually on an individual basis (due to the detachment type of assignments). During the assignment information is rarely exchanged between the consultant and the Getronics Consulting organization. As soon as the end of the assignment comes into sight the consultant informs his or her direct superior and/or account manager. After conclusion of the assignment the customer — on request — often fills in an evaluation form in which the satisfaction about the way the consultant has performed, can be expressed.

4.2.3 The human factor in knowledge sharing processes

In Section 3.5 (on page 30) we discussed three aspects of human characteristics related to knowledge sharing: the factors that drive people to do what they do (Subsection 3.5.1) and the possible skill levels and roles of an individual in an organization (Subsection 3.5.2).

For an organization like Getronics Consulting the consultants have — generally speaking — a strong drive and are highly motivated in their (often individual) assignments. They value knowledge sharing, but practice this only when a trust relation with a colleague has been established. These trust relations are not easily built, as consultants do not meet each other frequently.

The consultants usually have a high level of education (university or high-school graduates). Their practical experience ranges from junior to senior and principal consultancy skills; and, based on the subject of their assignment their skill level ranges from trainee to amateur, professional, specialist, and expert. Occasionally juniors are coupled to seniors for coaching, but these relationships are of a noncommittal character: the senior is seldom consulted in the yearly performance appraisal process of his or her pupil. Specialists and experts are mostly only known to a rather limited group of colleagues and are — due to their busy schedules — often hard to approach. A few selected employees get the opportunity to follow company-wide management development programs. Possibilities exist for attending seminars or courses, but Getronics Consulting does not have a specifically assigned education & training advisor and no overview of relevant educational programs is available. The personnel manager interviews consultants who resign, but there exists no structural method to limit the loss of their knowledge.

Getronics Consulting does not have specifically assigned roles for knowledge sharing. There are only knowledge users, but no line knowledge manager, competency knowledge manager, or chief knowledge officer is appointed.

4.2.4 The organizational factor in knowledge sharing processes

Getronics Consulting is a learning organization in the sense of being able to respond and adapt to change. In Subsection 3.2.4 (on page 25) we defined this type of organizational learning as single loop learning. Changes in the environment are interpreted through anticipated demands of customers. These demands are met through identification of topics in which a competitive advantage is perceived, so-called spearheads like E-Business, Customer Relationship Management, Business Process Re-engineering, Mobile Workforce, ICT-Management, Document Management, and Enterprise Resource Planning. Investment takes place to increase the competencies in these spearheads. The spearheads are each year anew determined based on market demands, available skills, and history.

In Section 3.6 (on page 34) we addressed the way in which organizational aspects can influence knowledge sharing: through the characteristics of the dimensions of the organization and through its culture. We depict the situation with respect to knowledge sharing within Getronics Consulting through the dimensions of the 7S framework by McKinsey (these are: strategy, structure, systems, staff, skills, style, and shared values; see Figure 3.4 on page 35) as follows:

Strategy

The mission of Getronics Consulting is to deliver — based on a vision on the developments in the market and society — expertise to their customers in the coherent field of organization and information and communication technology. The business strategy is derived from the above-mentioned spearheads that are seen as competitive advantages.

At the moment knowledge sharing is not included in this strategy. We discussed in Subsection 3.6.1 (on page 34) that if an organization sells customized, innovative services, such an organization should consider offering easy access to specialists and experts because people need to share information that would get lost if it would have been codified — this tacit oriented knowledge sharing strategy qualifies for Getronics Consulting.

Structure

The structure within Getronics Consulting — which determines the way in which tasks, responsibilities, coordination, and communication flows are organized — is moderately flat, low on formalities, market oriented, and arranged around the individual consultant (rather than around the team). Four business units exists: government and non-profit; trade, transport, and industry; finance; and telecom, utilities, and media. Each business unit is managed by a director who is assisted by (usually four) managing consultants and one or two secretaries. The staff consists of a small personnel department and general administrative, financial, and marketing positions. The general manager carries overall responsibility.

The prevailing communication flows take place vertically, bi-directional within a business unit. Usually once per six weeks a business unit meeting takes place, in which the business unit director presents (uni-directional) information about commercial achievements, organizational developments, and personnel changes. Besides these meetings the business unit publishes a newsletter on an infrequent base. The four business units are rather self-contained entities who have little interaction with the other business units, therefore we may define this structure as segmented rather than integrative; a situation that is somewhat encouraged by the financial accountability structure.

Consultants rarely change their business unit, if transitions happen it is mostly incurred because of deteriorated personal relationships. Job rotation within the Getronics Group does occur, but on a sparse basis and is limited to the Netherlands only.

Consultants enjoy a large autonomy in executing their assignments. Counseling is not structurally embedded in the way of working. Consultants are career-wise coupled to their direct superiors (the managing consultants) based on their current assignment. When a consultant starts a new assignment it is very likely that he or she will be tied to a different superior and has to start discussions about career plans and educational needs all over again. Junior consultants normally are assigned to a mentor who helps them in finding their way in the organization and who acts as a coach in their assignments.

Systems

In Subsection 3.6.1 (on page 34) we described systems as the collection of procedures to facilitate the business processes and support communication, coordination, and collaboration. The organization-wide e-mail functionality is a frequently used tool for communication between geographically dispersed consultants. The intranet of Getronics Consulting is discussed in Subsection 4.2.5. Periodically so-called OKE-sessions are organized (OKE is an abbreviation for the Dutch words 'Overdracht van KEnnis' that mean transfer of knowledge). In such OKE-sessions a consultant presents to a group of interested colleagues his or her knowledge about a certain topic, like for instance network security.

The existing collection of procedures offers few opportunities for building trust among consultants: except the above mentioned business unit meetings (in which there is only time to talk to each other during breaks) and sparse communal social activities, people do not meet each other face-to-face much. Therefore the most common way to built trust within Getronics Consulting is to carry out assignments together with one or more colleagues. The way of working does not provide in recording and making available project evaluations or lessons learned at the end of an assignment.

Staff, skills

In Subsection 4.2.3 we addressed the human factor in Getronics Consulting. We saw that there are no specifically assigned roles for knowledge sharing like a chief knowledge officer. Neither is the compensation scheme geared towards rewarding the sharing of knowledge or the accomplishment of goals through teamwork. Evaluation of someone's contribution of knowledge to the organization or for using knowledge of the organization forms no part of the yearly performance appraisal process either. So it appears there is a lack of motivational drivers to steer employees in the direction that seems necessary for knowledge sharing.

Style

The leadership style of Getronics Consulting shows no desired example behavior in knowledge sharing. Topmanagement is very busy in managerial issues (such as merging and integration of formerly distinct organizations) and seem not inclined to invest heavily (through time, money, actions, statements, or behavior) in 'new' and 'difficult' issues like knowledge sharing, probably because its potential or added value is not clearly realized.

Shared values

The culture (values, norms, and practices) and climate of an organization as treated in Subsection 3.6.2 (on page 36) are especially critical for knowledge sharing (Bair, 1997; Darling, 1996; Davenport et al., 1998a; O'Dell and Jackson Grayson, 1997; Elliott, 1997a; Fiol and Lyles, 1985; Gephart et al., 1996; Knapp and Yu, 1999; Schein, 1996a; Trussler, 1998; Weggeman, 1997). Sharing knowledge is a social interaction and builds upon people willingness to enter dialogues to share their own insights and value each other's thoughts. Consultants do realize this is essential for their own performance and also for a consultancy firm like Getronics Consulting but are not encouraged by the

existing values, norms, and practices to do so on a structural basis. The current culture is quite oriented towards the individual consultant and offers no clearly visible framework for knowledge sharing nor does it show the necessary steps to create such a framework or to change the soft factors — that constitute an organizational culture — in the desired direction.

4.2.5 The technology factor in knowledge sharing processes

In Section 3.7 (on page 37) we addressed the way in which technology — that is: information and communication technology — can support communication, collaboration, and knowledge sharing *any-time, any-place*. In such an environment people are electronically connected with other people or with information, and collaboration is facilitated and stimulated. Such an interconnected environment will have information and explicit knowledge components online, indexed, and mapped, so people can see what is available and are helped in finding it. This environment also supports communication between people, assists in the use of best practices to guide future behavior, and enables the sharing of ideas. Shared creation and capturing of tacit knowledge in for instance communities of practice, interest groups, or competency centers is facilitated. This interconnected environment offers a virtual space in which a team can collaborate interactively, irrespective of geographic distribution of the team members or time.

Getronics Consulting has already some elements of such an interconnected environment in place. Information and communication technology functionalities that can support knowledge sharing were segmented according to Anderson and Smith (1998, see Subsection 3.7.2 on page 39): office applications, groupware, document systems, work process systems, analytical systems, and knowledge systems. These functionalities can be realized by tools as described in Appendix C (on page 215) and depicted in Figure C.1 (on page 215). Some of these tools are present and employed by Getronics Consulting as follows:

Office applications

E-mail and messaging systems

Next to the more traditional forms of communication like face-to-face meetings, (mobile) telephone, facsimile, and memorandums Getronics Consulting employs organization-wide e-mail very heavily.

Calendaring and scheduling

These tools are mostly applied by the staff at the office of Getronics Consulting.

Personal productivity applications

Everyone uses an office automation suite for word processing, spreadsheets, and to create presentations.

Work Process systems

Electronic forms

Some electronic forms are used, for example for registration of billable, worked hours.

Knowledge systems

Information and knowledge retrieval

Internet

All the staff at the office and most consultants (either through private arrangements or through a connection via the intranet of Getronics Consulting) have access to the Internet.

Intranet

An intranet is accessible to all Getronics Consulting' employees, irrespective of time or their geographical location. This intranet offers news about Getronics, Getronics Consulting, and the market; links to other intranets within the Getronics Group; information about Getronics Consulting' spearheads, methods, and skills; personnel matters; minutes of internal (management) meetings; tips on using the PC and the intranet; description of procedures (for instance how to lend a video-beamer); and a discussion forum.

The intranet forms no part of the day-to-day business operation for the consultants. The majority of the consultants judge the content as not particularly interesting because it seldom offers help with their assignments, which brings about a low usage of the intranet. This low usage does not generate a stimulus for consultants to add content. The usage is measured, but these (quantitative) results are not been used to improve the content.

The intranet is user-friendly, well organized, and moderately fast, but there exists no search instrument to find needed content. Moreover, the retrieved content does not carry a status (for example whether it is company-policy, the degree of accuracy or trustworthiness, who the content-owner is, and so on).

Knowledge management

Knowledge databases and repositories

There is only a very limited amount of explicit and up-to-date knowledge stored in the intranet of Getronics Consulting. A few technologies, methods, and skills are described but no articles, lessons learned, best practices, project documentation and evaluations, manuals, or databases are available.

Knowledge routemaps and directories

The intranet of Getronics Consulting does not contain searchable curricula vitae of the consultants (for instance to gather information about the projects they are currently working on or were involved with) and it is not recorded who possesses which expertise or who has special interests. Neither does it offer links to documents that describe research results or does it list frequently asked questions or expert opinions.

Knowledge networks and discussions

Apart from the already mentioned e-mail functionality (which is used considerably) and the discussion forum of the intranet (which is used very infrequently) there are no opportunities for electronic interaction between consultants.

4.2.6 Observation and analysis

Knowledge sharing can become part of the way of working (as described in Subsection 4.2.2 on page 42) within Getronics Consulting as follows:

- acquisition of new assignments can be helped when more information about prospects and suspects becomes available online, including the history of assignments undertaken for the customer at hand;
- knowledge transfer from other account managers about the best way to close a deal in certain situations may prove also valuable to the acquisition process;
- delivering tenders may be helped by the existence of a skills database: finding the experts, needed to draw up the tender, becomes relatively easy;
- online storage of other tenders, which may serve as an example for a proposal, will prove to be useful;

- consultancy assignments can be helped by the use of a database in which relevant background information and knowledge is stored and access to experts is offered;
- the process to select the appropriate consultant for an assignment will benefit from the existence of a skills database;
- a consultant can prepare his or her intake at the client better when information about the customer and about assignments already undertaken there is easily accessible;
- the stored information about assignments already undertaken will also contain the name of colleagues (involved in one of those assignments), who can supply information on special characteristics of this customer;
- information on problems encountered during the assignment should be exchanged and registered with colleagues in brainstorm sessions or project progress meetings;
- to stay informed on relevant developments during the assignment, information and knowledge on subjects related to the assignment should be forwarded to the consultant;
- after conclusion of the assignment the lessons learned and project documentation should be stored online and made available to other consultants.

We argue that measures like those mentioned above, could be used to identify conditions that enable knowledge sharing. For example: the existence of a skills database calls for an organizational procedure that registers the competencies of consultants. This may lead to a human resource policy in which the leveraging of competencies is considered of strategic importance. Therefore we consider these measures as stimulations of conditions that enhance and support knowledge sharing in Getronics Consulting.

We define our descriptive empirical model as a matrix in which we confront the knowledge sharing processes (as presented in Section 3.3 on page 26) with the human, organizational, and technological aspects as they are prevalent in an organization. In this way, we aim to explore empirical situations with respect to knowledge sharing to learn which factors help and which hamper the sharing of knowledge in practice. This will assist in establishing the social, organizational, and technological conditions that enable knowledge sharing.

In Table 4.1 below we present our descriptive empirical model for Getronics Consulting. The table entries can be described as absent conditions for knowledge sharing. Because of the interactions and influences between people, organization, and technology, the entries of the table below, cannot always be tied unambiguously to only the people, or only the organization, or only the technology factor. Absent conditions that may be valid for more than one knowledge sharing process have been entered — for clarity purposes — only once in this table.

	People	Organization	Technology
Creating knowledge / tacit-to-tacit	• the motivation of consultants for knowledge sharing is not stimulated; • possibilities for the building of trust relations (by facilitating informal face-to-face contacts, for example by creating rooms where social interaction can take place: people in the field need socialization space) are not created;	• the process of mutual perspective taking, dialogue and interpretation in order to understand the meanings and to adopt the perspectives of other consultants is not supported; • there is no slack time for employees to be able to start and/or participate in dialogues; • the business processes and	• simplifications of and improvements on electronic communication and collaboration between consultants (consider for example groupware like electronic meeting systems, portable video conferencing systems, application sharing systems, shared whiteboards, electronic project room, electronic discussion systems,

	People	Organization	Technology
	• long term career-wise relationships between consultants and their superior do not exist; • mentorship and coaching, shadow-consulting and counseling are not enhanced; • there is no buddy system; • assignments are as a rule carried out by only one individual consultant, and not executed by teams; • brainstorm sessions, discussion sessions, and project progress meetings are not stimulated nor facilitated	activities that create or share knowledge are not identified; • specialists and experts are not visible nor easy accessible; • neither are specialists and experts from outside Getronics Consulting accessible; • only a limited form of integration between the (people of the) four business units takes place; • more bi-directional communication flows in the business unit meetings is needed; • the consultants should jointly develop a new code of conduct in relation to knowledge sharing	and co-authoring systems) is not looked into; • the existing intranet should be upgraded and perfected; • usage of the available discussion forum on the intranet is not stimulated
Creating knowledge / tacit-to-explicit	• trainings for improvement of dialogue, discussion, and discourse skills of consultants are not facilitated; • slack time for specialists and experts is not created; • the selection process of new employees does not take into account their motivation and ability to share knowledge; • at the end of an assignment the results and the lessons-learned are not presented to one's colleagues	• knowledge sharing is not included in the business strategy (as a tacit oriented knowledge sharing strategy), and knowledge sharing is not linked with the mission and business performance improvement, and not emphasized that it is a critical factor for success; • a knowledge-scan to answer questions like: what knowledge do we have now and what knowledge do we have to develop in the coming years, what new services or products are we going to develop with this new knowledge, and in what way are we going to develop the needed new knowledge is not executed (Heijst and Kruizinga, 1996); • the organizational structure to accommodate teams rather than individuals is not adapted; • there is no reward and recognition given — visible for the whole organization — to organizers of OKE-sessions (i.e. knowledge transfer sessions); • there is no time set aside or do there exist guidelines for consultants to write down their lessons learned and store the project documentation after finishing an assignment; • communities of practice and/or interest groups are not stimulated; • competence centers under supervision of competency knowledge managers do not exist	• the possibilities of implementing process support systems (expert systems, constraint-based systems, case-based reasoning, and neural networks) in order to aid consultancy problem solving are not examined; • there are no knowledge routemaps: either pointers to people with a special expertise (a skill inventory system helps locating people by expertise, community, skills, the projects they are currently working on or were involved with, interests and affiliation) or links to documents which describe research results or list frequently asked questions and the answers from experts
Creating knowledge / explicit-to-explicit	• there are no employees appointed who are specifically in charge for (encouragement of) knowledge	• there is no compensation and reward scheme defined (in more autonomy, more resources, virtual credits,	• a limited set of information and explicit knowledge components from within and from outside Getronics

	People	Organization	Technology
	creation and sharing (the chief knowledge officer); • there are no employees appointed who are specifically in charge for searching, collecting, and distributing knowledge (the line knowledge manager and the competency knowledge manager)	attractive assignments, boosting someone's ego, time, position, or money) for contributing knowledge to the organization and for using knowledge from the organization; • this is also not incorporated in the annual performance appraisal process: whereby this scheme should not only reward individual performance but collective improvement as well; • there is no awareness among topmanagement about the values and possibilities of knowledge sharing; • there is not an involved top manager elected as the knowledge champion (who can act as a sponsor and who can show desired example behavior in knowledge sharing)	Consulting is online (articles, project documentation and evaluations, presentations, work processes and procedures, reports, tenders, manuals, new — consultancy relevant — developments, and databases are deficient) and not indexed for easy retrieval; • easy creation and combining of explicit knowledge is not facilitated; • the possibility of implementing an integrated document management system to create structured document repositories (electronic libraries) is not investigated; • a study whether usage of analytical systems (decision support systems, data warehouse, data mining, and business intelligence) may result in data useful for consultants is not conducted
Creating knowledge / explicit-to-tacit	• structural training through educational programs for improvement of skill levels is not possible; • knowledge transfer of attended courses and seminars is not stimulated; • a problem of your assignment with your colleagues is not discussed regularly	• the current single loop organizational learning of Getronics Consulting which is now primarily based on individual knowledge creation is not changed to one based on learning at team, group and organizational level and additionally transferred to a double loop learning process through continuous experimentation and feedback; • job rotation (within type of assignments, business units of Getronics Consulting, or Getronics Group) is not stimulated; • measures to capture knowledge contributions and monitor a consultants' individual development and contributions are not defined	• only a few explicit knowledge components are online (lessons learned, methods, and best practices are not present); • consultants are not helped in tracking down valuable content on the Internet; • possibilities for online learning are non existent; • skill mining (for example based on the electronic discussions on the intranet) is not facilitated; • instruments to support thinking and reflection are not supplied
Valuation of new explicit knowledge	• employees specifically in charge for valuation of knowledge (the competency knowledge manager) are not appointed	• guidelines to determine when knowledge becomes accepted company policy are not laid down	• automated mechanisms to support the process whether new explicit knowledge has value for Getronics Consulting and is of sufficient quality are not introduced
Organizing & classifying assessed explicit knowledge	• employees specifically in charge for structuring of knowledge (the competency knowledge manager) are not appointed	• classification schemes (like categories, taxonomies, indexes, tables of contents, and data models) to structure explicit knowledge are not defined	• meta-data is not added to the explicit knowledge (like a status, whether the knowledge is company-policy, the degree of accuracy or trustworthiness, who the content-owner is, and so on)
Storing structured explicit knowledge			• only one or two people are allowed to add and store information and knowledge into the intranet of Getronics Consulting: there are no predetermined guidelines to let everybody be able to do this; • the guidelines for adding

	People	Organization	Technology
			information and knowledge into the intranet are not defined
Maintaining and refining stored explicit knowledge		• procedures to determine when knowledge becomes out-of-date or can be improved are not defined	• only one or two people maintain and refine the stored information and knowledge of Getronics Consulting' intranet: there is no regular inquiry whether the content is congruent with the users' needs; • the content of the intranet is not kept up-to-date (nor 'magnet content' supplied)
Distributing stored explicit knowledge		• automatic push of stored information and knowledge is not introduced	• possibilities for consultants to subscribe to or show interests in certain subjects are not present
Accessing stored explicit knowledge		• it is not investigated periodically whether it is easy to find the desired content and nor is the level of its accurateness determined	• the intranet does not form part of the day-to-day business of consultants (for example no requests for holidays or declaration forms can be submitted); • everybody has access to the stored information and knowledge but usage is low: the content does not support consultants in the execution of their assignments ("How will this improve my day?" Elliot, 1997a); • a search-mechanism on the intranet content is not present; • no information maps, digital intelligent search-agents, or knowledge wizards are implemented to aid in the navigation and retrieval process
Using explicit knowledge	• no investigation takes place how to improve usage of explicit knowledge in the actions and decisions of all employees	• it is not known whether there are values, norms, and practices of Getronics Consulting which may hinder the usage of certain explicit knowledge	
Using tacit knowledge	• how to improve usage of tacit knowledge in the actions and decisions of all employees is not investigated	• no enquiry takes place whether there are values, norms, and practices of Getronics Consulting which may hinder the usage of certain tacit knowledge	

Table 4.1: Absent conditions in Getronics Consulting

4.3 Case 2: Royal Netherlands Air Force

4.3.1 Description

The Royal Netherlands Air Force is — together with the Royal Netherlands Navy, the Royal Netherlands Army, and the Royal Marechaussee — part of the Ministry of Defense that is responsible for the military security of the Netherlands. The Dutch defense and security policy consists of three main tasks:

- defending own territory and territory of allies against a military threat and security risks;
- protection and furtherance of international law and order, for example by partaking in peace-operations;
- support and assistance of civil government duties, as well as international relief operations.

The deployment of military instruments in the air has proved very effective in crisis prevention, peace keeping, and relief operations. The Royal Netherlands Air Force generates an essential contribution to the enforcement of the Dutch defense and security policy:

- 30% the surface of the earth is covered with land and 70% is covered with sea, but any location can be reached by air, unhindered by obstacles on the surface of the earth, such as mountain chains, rivers, lakes, or oceans;
- various types of deployment are possible: air defense (to gain and hold air supremacy), air-attack (fighting and strategic bombardments), air support (offering assistance to ground and navy troops), reconnaissance, transport of passengers and cargo (material, fuel, or goods for humanitarian relief), and search and rescue (tracking down and saving missing persons);
- the dominant characteristics of air force such as: flexibility, rapid reaction time, ability to adapt, striking range, speed, capability to operate at high altitudes, precision attacks, and geographical mobility.

The mission of the Royal Netherlands Air Force — as an indication of their future direction — bears upon the defense of the nation's airspace and the support of operations at land and at sea, whenever and wherever the Kingdom of the Netherlands desires. 'Air Power' is the core product of the Royal Netherlands Air Force: the capability to (help) achieve military (and political) goals with the use of the air space, for example by employment of manned and unmanned aerial vehicles, guided missiles, and spacecraft. Air Power is delivered autonomous and in collaboration with international organizations as the United Nations (UN), the North Atlantic Treaty Organization (NATO), and the European Union (EU).

4.3.2 Way of working

The manner in which operational management is organized, the structuring of headquarters and operational bases, and the type of material that is deployed in the Royal Netherlands Air Force (Ras, 2000), help us to identify their way of working. The way of working is primarily focused on keeping the operational ability to deliver Air Power in maximum shape. Air Power is deployed for peace-keeping, peace-enforcing, and relief operations. Besides military manoeuvres to practice for example joint operations, formal requests to deploy this Air Power come from the Ministry of Defense, the Ministry of Foreign Affairs, or directly from allies and have to be approved by the Government and Parliament. During deployment of the Royal Netherlands Air Force in combined, international operations the Ministry of Defense and the Commander-in-Chief stay entitled to exercise their right to Full Command, i.e. they can withdraw units or they may embargo their deployment.

Operational management

The Royal Netherlands Air Force is headed by the Commander-in-Chief and divided into three major commands: the Tactical Air Force: responsible for the bases of operation; the Logistics Center, which is responsible for material and logistics; and the Royal

Military School of the Air Force, which constitutes the training component. The commanding officers of these three major commands give direction to the commanders of the operational units. These unit commanders are responsible for the operational task of the unit involved.

The Headquarters of the Royal Netherlands Air Force functions as the administrative heart of the organization and comprises a number of staff divisions and directorates: the Deputy Commander-in-Chief (who also acts as Chief of Staff for daily operations), the Director of Control (business management), the Director of Material (logistics), and the Director of Personnel.

Organizational units

Next to Headquarters, four types of organizational units exist: the Tactical Air Force, Logistics, Training (i.e. the three major commands), and Other.

- The Tactical Air Force can be divided into three categories:
  - airbases that station the fighting, transport, and helicopter squadrons (Eindhoven, Gilze-Rijen, Soesterberg, Leeuwarden, Twenthe, and Volkel);
  - the Tactical Helicopter Group that provides air support to ground operations — by airlifting personnel, VIPs, and members of the Royal Household, as well as equipment — and that performs air reconnaissance;
  - the Guided Weapons Group that protects a geographical area, a town, or vital object from enemy air attacks using guided weapons (ground-based air defense).
- Logistics consists of the two following operational units:
  - the Electronic Material Depot is responsible for providing to all units the appropriate equipment and maintenance, testing, and calibration of — the often very specialized — electronic equipment;
  - the Mechanical Aircraft and Jet Engine Depot functions as a logistic service center with three core tasks: it functions as a wholesaler, a maintenance center, and a technical center in which sophisticated aeronautical maintenance, revision, and repairs to fighter aircraft, jet engines, and helicopters is carried out.
- The organizational unit Training is formed by three components:
  - the Royal Military Academy: their goal is to train men and women as officers in the Royal Netherlands Army and the Royal Netherlands Air Force, preparing them for leadership positions;
  - the Royal Military School of the Air Force is responsible for training the ranks below officers (for example corporals and privates) and runs also several specialist courses for officers (such as the pilot training program);
  - the Electronic and Technical School offers the majority of all specialist trainings within the Royal Netherlands Air Force (for instance how to operate the weapon systems).
- Other organizational units are:
  - the Air Operations Control Station, which is responsible for the continuous patrol and defense of the national and NATO airspace through control and coordination of all military air movements, providing security for the air traffic therein during peacetime as well as during wartime and crises;
  - the Meteo Group is committed to the delivery of round-the-clock specialized meteo information to the Royal Netherlands Army as well as the Royal Netherlands Air Force;
  - the Flight Safety, Training, and Test Center is responsible for the enhancement of the knowledge of pilots with respect to flight safety equipment. They pro-

vide for example education and training on subjects such as the functioning of the ejection seat, underwater escape techniques, flight safety outfits, dinghy drills, and land and sea survival techniques.

Material

The Royal Netherlands Air Force deploys four groups of material: fighter aircraft, helicopters, air transport aircraft, and guided weapons.

- The fighter aircraft (F-16 Fighting Falcon): an extraordinary swift, highly maneuverable multi-task jet airplane for air defense, air to ground attack, nuclear tasks, and tactical air observation.
- Helicopters (Apache, Chinook, Cougar, and others) can accomplish several distinct tasks: air to ground attack, air support for ground and navy troops, air reconnaissance, transport of (injured) personnel, equipment, and food, search and rescue operations, disaster relief, and medical evacuation.
- Air transport aircraft (DC-10, Hercules, Gulfstream, Fokker 50 and 60) that are used to carry — in long- and short-range — military and civil passengers and/or cargo, and that can function as tanker aircraft (air-to-air refueling of other aircraft).
- Guided Weapons (Patriot, Hawk, and Stinger) are those weapons that provide ground-based air defense. They protect a designated area from enemy aircraft and missiles. The Patriot and Hawk are launched from a position on the ground. The missiles are then guided by radar to the target, which is why they are called 'guided weapons'. The Stinger is a portable weapon (a heat searching missile) and is fired from the shoulder for self-defense of guided weapon units in the field.

4.3.3 The human factor in knowledge sharing processes

The three aspects of human characteristics involved with knowledge sharing (as discussed in Section 3.5 on page 30) are: the factors that drive people to do what they do (Subsection 3.5.1), the possible skill levels of an individual in an organization, and the roles an individual can play in an organization (Subsection 3.5.2).

The employees (about 13.000 men and women, of which 1.700 civilians) in the Royal Netherlands Air Force have a sense of working for 'a higher purpose: the common good' (the defense of one's country) that creates a very intense drive in crises where people are extremely motivated to complete the mission successful. In non-crisis situations there tends to be a bureaucratic behavior and "a high level of 'political manipulation' and pro- and con-group forming in the whole day-to-day steering of the organization" (Bladel et al., 1997), which may hinder motivation.

The Royal Netherlands Air Force is a rather closed community in which most people know each other very well due to jointly followed trainings at the military academy, frequent job rotations, countless social activities and "innumerable fora, work parties, discussion-groups, special task groups, and other permanent and semi-permanent meeting structures" (Bladel et al., 1997). Information and knowledge sharing is valued — sometimes even one's life may depend on this — but the necessary infrastructure for integrated electronic information flows lacked. This fact initiated the KLUIM project.

The educational level of employees of the Royal Netherlands Air Force is very heterogeneous: from primary school to military academy and university. Every (military) rank — from plain soldier to Commander-in-Chief — is tied to intensive training programs that are

obligatory. These trainings are given at internal educational institutions. For civilians abundant possibilities exist for job-related training at public educational institutions. In the organization much attention is paid to satisfy educational needs of all employees on a structural basis, for which considerable financial means are reserved. The skill level of employees depends on one's ability, education, and practical experience and ranges from trainee to amateur, professional, specialist, and expert.

The Royal Netherlands Air Force does not have explicitly assigned employees for knowledge sharing roles like a line knowledge manager, competency knowledge manager, or chief knowledge officer.

4.3.4 The organizational factor in knowledge sharing processes

An organization can influence knowledge sharing in different ways (see Section 3.6 on page 34): the type of organizational learning (Subsection 3.2.4), the possible dimensions of an organization (Subsection 3.6.1), and the culture of an organization (Subsection 3.6.2).

The learning within the Royal Netherlands Air Force can be characterized as adaptive or single loop learning: the organization can cope with change in its environment and adapt it's way of working accordingly. Depending on altered political, social, and technical circumstances the Royal Netherlands Air Force adapts its behavior for alignment with the new situation. An example is the increasing contribution to international peace-keeping operations as a rapid deployment force.

The dimensions of the Royal Netherlands Air Force as characterized through the 7S framework by McKinsey (that focuses on the organizational elements: strategy, structure, systems, staff, skills, style, and shared values; see Figure 3.4 on page 35) — with respect to knowledge sharing — are described below:

Strategy

The mission of the Royal Netherlands Air Force is to deliver 'Air Power': the capability to achieve goals — national as well as international — through air space. From this mission, individual missions and strategies are derived by every element of the organization. Knowledge sharing is not explicitly addressed in the strategy, but in all sorts of policy documents attention is paid to aspects of knowledge sharing (Cornelis, 1998). Knowledge sharing is considered necessary due to the continuous renewal of the material (how to operate and maintain this) and due to the changing — political — environment in which the Royal Netherlands Air Force operates.

Structure

The Royal Netherlands Air Force is headed by the Commander-in-Chief who is in charge of the Air Staff at Headquarters, and who oversees the commanding officers of the operational bases. The organization is partitioned in four directorates (Bladel et al., 1997):

Operations: responsible for all operational aspects and the deployability of the combat power and its support systems;

Material: in charge of material (including procurement and maintenance of weapon systems, infrastructure, and all other (also office) equipment), logistics, and quality assurance;

Personnel: responsible for personnel matters (hiring, training, re-education, job-rotation, management development, career planning, and firing) and health care;

Control: in charge of all financial matters, matters of economic management, business management consultancy, auditing, and information technology and automation.

The Royal Netherlands Air Force is organized in a strict, rank-based hierarchy. The structure — that is the way tasks, responsibilities, coordination, and communication flows are organized — is been transformed with an emphasis on decentralization and contract management in which people will be held accountable for the (financial) result of their department. The dominant communication flows take place vertically, bi-directional within a directorate (Bladel et al., 1997). There is interaction between the four directorates, but because of power plays or even mistrust inter-directorate communications are often not extremely fruitful.

Systems

Systems can be defined as the collection of procedures to facilitate the business processes and which support communication, coordination, and collaboration. In order to support the decentralized organizational structure, and to integrate the numerous separated local networks and the unconnected information flows the project KLUIM was initiated. The project KLUIM has the objective to realize a uniform, fully integrated, nationwide, safe, robust, and reliable information and communication technology infrastructure. This infrastructure enables people to electronically connect with each other and links applications; it consists of standardized networks, workplaces, control and management software, and puts thorough emphasis on security applications. The project also encompasses training and education of the users as well as the network administrators and takes care of the migration of existing software applications to the new infrastructure. The organization-wide intranet as well as local intranets is build on top of this information and communication technology infrastructure as tools for information and knowledge transfer between people within the Royal Netherlands Air Force. In the way of working serious emphasis is put in describing lessons learned of practical experiences. The new infrastructure improves greatly the process to make these lessons learned available on a wider scale.

Staff, skills

Personnel frequently — on the average about every 3 years — experiences changes in position and work location, mostly within a directorate but sometimes also within the Ministry of Defense and occasionally even on an international level. It is very often used as a way to advance one's career. The Royal Netherlands Air Force offers (as mentioned in Subsection 4.3.3) numerous education and training amenities to its personnel and it employs a Management Development program to give guidance to promising officers. In relation to knowledge sharing we already observed that there is no chief knowledge officer or related position and that sharing of knowledge is not reflected in the performance appraisal process or compensation scheme.

Style

Rank, hierarchy, and location influence the leadership style. At the air force bases the style is operational as compared to Headquarters. It seems that knowledge sharing is not of leading priority to topmanagement and is therefore not directly reflected in the strategy or dedicated positions in the staff nor shown in example behavior by the highest ranking officers. A lot of dialogue and discussion takes place in many bodies of deliberation, but due to political struggles (between the four directorates and between Head-

quarters and the operational bases) they not often result in tangible, practical results, which accentuate an aura of bureaucracy.

Shared values

We already saw (in Subsection 3.6.2 on page 36 and in Subsection 4.2.4 on page 44) that the culture of an organization (i.e. their values, norms, and practices) has an important influence on knowledge sharing within that organization. Due to the social nature of knowledge sharing people need to be encouraged by their organizational environment to share their own thoughts and ideas and value and appreciate the views of others. The prevailing values, norms, and practices of the Royal Netherlands Air Force indicate that a transformation occurs to a situation in which initiative and ideas of individuals — irrespective of their rank — are valued and acted upon. The 'family-like' organizational climate, in which most people know each other very well, stimulates a high degree of trust between these people. When the four directorates will be able to combine their different perspectives as a way to reach a common goal a very strong fundament for knowledge sharing in the Royal Netherlands Air Force will be present.

4.3.5 The technology factor in knowledge sharing processes

Information and communication technology — as described in Section 3.7 (on page 37) — can provide an interconnected environment to support communication, collaboration, and knowledge sharing. The Royal Netherlands Air Force has already undertaken major efforts to make explicit knowledge components electronically available and to enable electronic communication and exchange of ideas between people, both on an organization-wide scale.

In Subsection 3.7.2 (on page 39) we introduced a segmentation of information and communication technology functionalities that can support knowledge sharing and in Appendix C (on page 215) we described tools that can realize these functionalities. Based on a situation in which the project KLUIM is a great deal underway but not yet completely accomplished, the Royal Netherlands Air Force applies the following tools:

Office applications

E-mail and messaging systems

Beside communication tools already in use (face-to-face meetings, (mobile) telephone, facsimile, and memorandums) e-mail is employed heavily on the local networks. E-mail on an organization-wide scale will be possible after completion of the project KLUIM.

Calendaring and scheduling

These tools are mostly applied by the administrative staff at Headquarters or operational bases.

Personal productivity applications

An office automation suite for word processing, spreadsheets, and creating presentations is part of the standardized workplace.

Groupware

Same time - different place

Chat systems; application sharing systems; shared whiteboards; collaborative virtual environments; video conferencing systems

The Royal Netherlands Air Force has access to video conferencing systems within the Ministry of Defense, but usage is low.

Document systems

Integrated document management

No integrated document management system is used. The Royal Netherlands Air Force does have an extensive and very professional library at Headquarters, medium sized libraries at their educational institutions, and some small libraries at the operational air bases.

Analytical systems

Decision support systems

Some systems for special purpose processes (like ballistics), also aid in decision making.

Business intelligence

The Royal Netherlands Air Force applies analytical systems that support their intelligence process.

Knowledge systems

Information and knowledge retrieval

Internet

Most employees can have access to the Internet by using a — often communal — stand-alone PC (due to strict security reasons).

Intranet

Within the Royal Netherlands Air Force several separate intranets on the local networks of organizational units are in use. An organization-wide intranet can be launched after the project KLUIM is accomplished. The existing local intranets are accessible to all employees of that location and offer content such as news, announcements, guidelines, and fun-sections.

Online learning

No online learning is used, although various educational materials are available on CD-ROM.

Knowledge management

Knowledge databases and repositories

On the local intranets only a handful of explicit and up-to-date knowledge components are stored: some articles, manuals, lessons learned, best practices, and project documentation.

Knowledge routemaps and directories

The local intranets do not provide pointers to people with a special expertise: they do not contain curricula vitae of the employees that can be searched nor is their know-how or interest profile electronically stored and made available. Except from the already mentioned stored knowledge components, the local intranets do not offer documents that contain pointers to knowledge.

Knowledge networks and discussions

In practice the majority of electronic interaction in the Royal Netherlands Air Force is generated by the e-mail functionality.

4.3.6 Observation and analysis

Knowledge sharing may become part of the way of working in the Royal Netherlands Air Force (as presented in Subsection 4.3.2 on page 52) as follows:

- deployment of Air Power in operations may — in some cases — shift from reactive to pro-active when more information about potential conflicts becomes available online, including relevant historic developments and when assessments of the situa-

tion are shared on a wide scale within the Royal Netherlands Air Force and liaison organizations;
- knowledge from experienced personnel about the best way to operate and maintain (specialized) material can be transferred into a database or into online learning material or can be made available in one-to-one or one-to-many workshops;
- the existence of an organization-wide skills database for finding needed expertise will help to speed up this process;
- online storage of up-to-date manuals and operating procedures can reduce costs (for example printing, paper, distribution, and labor costs);
- during and after the operations, information on problems encountered should be exchanged with colleagues and experts in brainstorm sessions and compiled into lessons learned and made electronically available;
- to stay informed on relevant military and political developments during an operation, information and knowledge on subjects related to the operation and the organization itself should be forwarded to personnel in the field;
- to stay informed on developments in an operation, relevant information and knowledge of the field should be forwarded to the Command and Control unit;
- stimulate the structural exchange of ideas, views, and thoughts between the directorates and between Headquarters and the operational bases to create an understanding for the different perspectives.

We follow the same line of reasoning as we did with the case study Getronics Consulting (as addressed in Subsection 4.2.6 on page 47): the suggestions stated above can be used to identify conditions that enable knowledge sharing. These suggestions are considered as stimulations of conditions that enhance and support knowledge sharing in the Royal Netherlands Air Force. The possible relationships between the knowledge sharing processes (as defined in Section 3.3 on page 26) and the human, organizational, and technological aspects as existent in the Royal Netherlands Air Force are identified through elaboration on absent conditions, as formulated in Table 4.2 (our descriptive empirical model) below.

The remarks made in the similar section on the Getronics Consulting case (Subsection 4.2.6) about the way to read this table (loose coupling, connectedness, and single occurrency), also apply here.

	People	Organization	Technology
Creating knowledge / tacit-to-tacit	• the motivation of personnel for knowledge sharing is not stimulated; • there is a very partial mentorship and coaching; • a buddy system for new personnel does not exist; • brainstorm sessions, discussion sessions, and project progress meetings across directorates and between Headquarters and operational bases are not stimulated nor facilitated	• the process of mutual perspective taking, dialogue and interpretation in order to understand the meanings and to adopt the perspectives of colleagues irrespective of their directorate or work location is not supported; • there is no or only a limited amount of slack time for employees to start and/or participate in dialogues; • the activities that create or share knowledge are not identified; • specialists and experts are not visible and nor easy accessible; • also specialists and experts from outside the Royal	• no investigation into introduction of, simplifications of, and improvements on electronic communication and collaboration between personnel (consider for example groupware like electronic meeting systems, portable video conferencing systems, application sharing systems, shared whiteboards, electronic project room, electronic discussion systems, and co-authoring systems) is undertaken; • no company-wide intranet is installed with the existing local intranets linked into it; • usage of the discussion fora on the intranets is not stimulated

	People	Organization	Technology
		Netherlands Air Force and from outside the Ministry of Defense are not easy accessible; • there is little integration between the (people of the) four directorates; • no jointly developed code of conduct in relation to knowledge sharing exists	
Creating knowledge / tacit-to-explicit	• no trainings for improvement of dialogue, discussion, and discourse skills of personnel are facilitated; • no slack time for specialists and experts is created; • in the selection process of new employees their motivation and ability to share knowledge is not taken into account	• knowledge sharing is not included in the strategy, neither is knowledge sharing linked with the mission and organizational performance improvement, and nor is it emphasized that it is a critical factor for improvement; • no knowledge-scan is executed to answer questions like: what knowledge do we have now and what knowledge do we have to develop in the coming years, what new services are we going to develop with this new knowledge, and in what way are we going to develop the needed new knowledge (Heijst and Kruizinga, 1996); • no reward and recognition is given to people who share their knowledge, nor is this done visible for the whole organization; • no time is created nor guidelines exist for personnel to write down their lessons learned and store the project documentation after finishing an assignment; • no communities of practice and/or interest groups across directorates and between Headquarters and operational bases are stimulated; • no competence centers under supervision of competency knowledge managers exist	• the possibilities of implementing more process support systems (expert systems, constraint-based systems, case-based reasoning, and neural networks) are not examined in order to aid problem solving in daily work activities; • no knowledge routemaps are present: either pointers to people with a special expertise (a skill inventory system helps locating people by expertise, community, skills, the projects they are currently working on or were involved with, interests and affiliation) or links to documents which describe research results or list frequently asked questions and the answers from experts are available
Creating knowledge / explicit-to-explicit	• no employees are appointed specifically in charge for (encouragement of) knowledge creation and sharing (the chief knowledge officer); • no employees specifically in charge for searching, collecting, and distributing knowledge (the line knowledge manager and the competency knowledge manager) are present	• no compensation and reward scheme (in more autonomy, more resources, virtual credits, attractive assignments, boosting someone's ego, time, position, or money) is defined for contributing knowledge to the organization and for using knowledge from the organization; • neither is this incorporated in the annual performance appraisal process: this scheme should not only reward individual performance but collective improvement as well; • no awareness exist among top ranking officers about the values and possibilities	• a limited amount of information and explicit knowledge components are online (articles, project documentation and evaluations, presentations, work processes and procedures, reports, manuals, new — air force relevant — developments, and databases are lacking) from within and from outside the Royal Netherlands Air Force; • easy creation and combining of explicit knowledge is not facilitated; • the possibility of implementing an integrated document management system to create structured document repositories

	People	Organization	Technology
		of knowledge sharing; • no involved top ranking officer act as the knowledge champion (who can be active as a sponsor and who can show desired example behavior in knowledge sharing)	(electronic libraries) is not investigated
Creating knowledge / explicit-to-tacit	• knowledge transfer of attended courses and seminars is not stimulated; • wide knowledge transfer of lessons learned is not encouraged	• the current single loop organizational learning of the Royal Netherlands Air Force which is now primarily based on knowledge creation within a directorate is not changed to one based on learning at organizational level; • job rotation to other directorates is not stimulated; • measures to capture knowledge contributions and monitor an employees' individual development and contributions are not defined	• very few explicit knowledge components are online (lessons learned, methods, and best practices are not present); • personnel is not helped in tracking down valuable content on the Internet; • possibilities for online learning is non existent; • skill mining (for example based on the electronic discussions on the intranets) is not facilitated; • instruments to support thinking and reflection are not supplied
Valuation of new explicit knowledge	• no employees specifically in charge for valuation of knowledge (the competency knowledge manager) are appointed	• no guidelines exist to determine when knowledge becomes accepted organizational policy	• no automated mechanisms are introduced to support the process whether new explicit knowledge has value for the Royal Netherlands Air Force and is of sufficient quality
Organizing & classifying assessed explicit knowledge	• no employees are present specifically in charge for structuring of knowledge (the competency knowledge manager)	• no classification schemes (like categories, taxonomies, indexes, tables of contents, and data models) are defined to structure explicit knowledge	• no meta-data is added to the explicit knowledge (like a status, for example whether the knowledge is organizational policy, the degree of accuracy or trustworthiness, who the content-owner is, and so on)
Storing structured explicit knowledge			• only a limited number of people are able to add and store information and knowledge into the intranet (according to predetermined guidelines); • no guidelines for adding information and knowledge into the intranet are defined
Maintaining and refining stored explicit knowledge		• no procedures exist to determine when knowledge becomes out-of-date or can be improved	• no regular enquiry takes place whether the content is congruent with the users' needs; • the content of the intranets is not kept up-to-date (neither is 'magnet content' supplied)
Distributing stored explicit knowledge		• no automatic push of stored information and knowledge takes place	• no possibilities for personnel to subscribe to or show interests in certain subjects is available
Accessing stored explicit knowledge		• no periodical investigation takes place whether it is easy to find the desired content and determine the level of its accurateness	• the intranet forms no part of the day-to-day activities of employees (for example submitting requests for leave of absence is not possible); • everybody has access to the stored information and knowledge but usage appears low: content does not support personnel in the execution of their assign-

	People	Organization	Technology
			ments ("How will this improve my day?" Elliot, 1997a); • no search-mechanism on the content of the intranets does exist; • no search to access the content on the company-wide intranet but also on the linked local intranets is available; • no information maps, digital intelligent search-agents, or knowledge wizards to aid in the navigation and retrieval process are present
Using explicit knowledge	• no investigation takes place how to improve usage of explicit knowledge in the actions and decisions of all employees	• it is not known whether there are values, norms, and practices which may hinder the usage of certain explicit knowledge	
Using tacit knowledge	• no improvement on the usage of tacit knowledge in the actions and decisions of all employees is initiated	• it is not investigated whether there are values, norms, and practices which may hinder the usage of certain tacit knowledge	

Table 4.2: Absent conditions in the Royal Netherlands Air Force

4.4 Reflection

For a consultancy firm like Getronics Consulting, knowledge is their core product. However, when we look at Table 4.1 we observe Getronics Consulting misses an opportunity here. This opportunity is twofold: to improve their own way of working and to sell their expertise in this field to customers (where they can show they take their own medicine). Possibly because Getronics Consulting is a strong financial driven organization, short term activities receive more attention than long term issues.

We suggest that an important step forward for Getronics Consulting may lie in realizing the values and possibilities of knowledge sharing, to facilitate a free flow of thoughts and ideas, and to have assignments not carried out by only one individual consultant, but to have these assignments executed in teams. This step would need the support of management. Because the 'concept of knowledge' does not bear credibility to most managers, a sort of enlightenment on the intuitive value of knowledge has to strike one or two managers so that they can initiate and/or sponsor knowledge programs (the so-called knowledge champions). Skyrme (1997) argues that "the greatest inhibitor to knowledge sharing was inappropriate behaviors and organizational culture" and therefore a successful knowledge programme includes "a knowledge leader or champion — someone who actively drives the knowledge agenda forward, creates enthusiasm, and commitment" and "top management support — a CEO who recognizes the value of knowledge and who actively supports the knowledge team in its work." Management is in the position to bring into use the power needed to enforce organizational change

Another instructive aspect of this case study is that when organizations are too much in a state of flux, their attention is too often drawn away from new developments such as knowledge sharing programs. Perhaps organizations should also have a certain kind of

maturity in their way of working: it probably does not work to implement a sophisticated competence management system when elementary etiquette and basic functionalities do not operate as they should operate. Garvin (1993) remarks "Continuous improvement requires a commitment to learning. … In the absence of learning, companies — and individuals — simply repeat old practices." Some organizations fail to integrate learning into the fabric of daily operations, they lack the capability to enter double loop learning (as explained in Subsection 3.2.4 on page 25).

The diminished chance of going to war prompts developments in the Netherlands society to cut the defense budget and reduces the attractiveness of the Royal Netherlands Air Force for (possible future) employees. The strategy of the Royal Netherlands Air Force to cope with these developments is twofold: integration and extensive collaboration with other parts of the Ministry of Defense (through common doctrines, procedures, standards, and systems) and to intensify competence development of their employees. Ras (2000) emphasizes that the central theme in the assessment and coaching of personnel is the development of the employee. "Appropriate education means investing in the quality and motivation of people, which benefits the organization as well as the individual" (Ras, 2000).

A certain level of internal mistrust between directorates, Headquarters, and air bases does exist. We reason that — with respect to knowledge sharing — the Royal Netherlands Air Force may profit immensely if this mistrust could be altered into a situation in which people value and accept each other perspective.

This case study teaches us that an understood strategic focus may help in coping with a changing environment. APQC (2001) reports that "through its research and knowledge management implementation experience, has found that successful knowledge management approaches are aligned to the strategic focus of the organization." In addition, an adequate amount of trust between people, an open climate, and a flexible, networked organizational structure seems essential for a collective effort to realize a change from an organization where the balance of power and secrecy is a way of life to an institute that cooperates with affiliated organizations and concentrates on the development of their employees. In this respect Gephart et al. (1996) observe "An open, trusting culture in which there is no blame creates the freedom for people to take risks and express their views" and describes an employee-involvement program "which is transforming its climate from one of distrust between workers and management to one of mutual respect and cooperation": the organizational environment is set up to create synergy between people so they will be able to do things better.

When we reflect on the two case studies presented in this chapter, we may conclude that conditions do exist that encourage knowledge sharing in these organizations. From Table 4.1 and Table 4.2 we observe that several of these conditions are absent in the two organizations at hand. We suggest this may follow from the fact that (traditionally) more emphasis is put on individual performance in stead of a way of working that focuses on communication, cooperation, and collaboration.

The revenues of knowledge sharing — like an enhanced ability to act upon signals from the environment, an improved level of service to customers, business process improvement, access to best practices or lessons learned, cost reduction through fewer mistakes and repetitions, or a stronger feeling of well-being for employees — are not easily quantifiable but are unmistakably there. Therefore we argue that the forces of change that we mentioned

in Section 1.2.2 (on page 2), combined with these revenues, should steer an organization into a transition from an individual to a collective way of working.

To accomplish the transition to the situation that focuses on communication, cooperation, and collaboration, alteration of the organizational culture and components in the way of working seems mandatory. Table 4.1 and Table 4.2 (on page 51 and 62 respectively) give some indication of possible measures to incorporate knowledge sharing in the way of working of an organization: adaptation of the human resource policy to steer behavior in the desired direction, stimulating the development of people, creating possibilities for people to meet each other, encouragement to learn from others, and providing an adequate technical infrastructure. In the next chapter these measures will be translated into conditions that enable knowledge sharing.

4.5 Conclusion

In this chapter we analyzed two case studies: organizations of quite a different nature that have been studied using the human, organizational, and technological factors that influence their knowledge sharing processes. This concluded the initiation step of the inductive-hypothetical model cycle. We presented our descriptive empirical model in this chapter: a matrix in which the knowledge sharing processes are related to the factors people, organization, and technology by means of describing conditions that are absent but may help to enhance and support knowledge sharing in an organization. The key issues of this descriptive empirical model are abstracted in the next chapter into a descriptive conceptual model.

5 ENABLING CONDITIONS

You cannot predict the future,
but you can build it.
A. Kay

5.1 Introduction

In the preceding chapters we concluded the initiation step of the inductive-hypothetical model cycle. This resulted in our descriptive empirical model: a matrix in which the knowledge sharing processes are related to social, organizational, and technological knowledge sharing aspects. This chapter uses our descriptive empirical model and combines it with existing knowledge management theory to construct a descriptive conceptual model in which conditions that enable knowledge sharing are described.

We wrote in Section 2.2 (on page 12) that organizations will need to provide for conditions such that people can trust each other, work together, are motivated to share ideas, and can engage in dialogues in order to share thoughts and knowledge. In the existing theory similar and other conditions can be discerned. For example, Long (1997) mentions the motivation of people, behavioral norms, values, and practices of the organization, and an adequate technological infrastructure. Smith (1998) recognizes "The degree of trust and openness in organizational communities; the personal consequences of collaboration; effective learning platforms; and many other subtle aspects of human interaction" and Krogh (1998) believes that care is an essential condition for knowledge sharing. We will integrate these and other related theories into our descriptive conceptual model.

The — in our view most relevant — conditions that enable knowledge sharing processes are derived from the existing literature and from the findings from Table 4.1 and Table 4.2 of Chapter 4 (on page 51 and 62 respectively). These conditions are structured into social, organizational, and technological factors, analogous to our descriptive empirical model. For each condition identified in this chapter we give a description, we address its possible influence on knowledge sharing, and we present the drivers that may trigger or influence that condition. An overview of these enabling conditions is given in Figure 5.1 (on page 66).

5.2 Social conditions and enablers

We discussed in Subsection 3.5.1 (on page 31) that conditions can be created affecting the needs of people and the characteristics of the situation in order to influence behavior of individuals. These conditions can thus be used to encourage certain types of behavior and repress others. We categorize the — social factor related — conditions according to the relationships between people and knowledge sharing as we described in Section 3.5: motivation; values, attitude, moods, and emotions; skill levels and roles. For each of these categories we present their related conditions that we consider as facilitators of knowledge sharing.

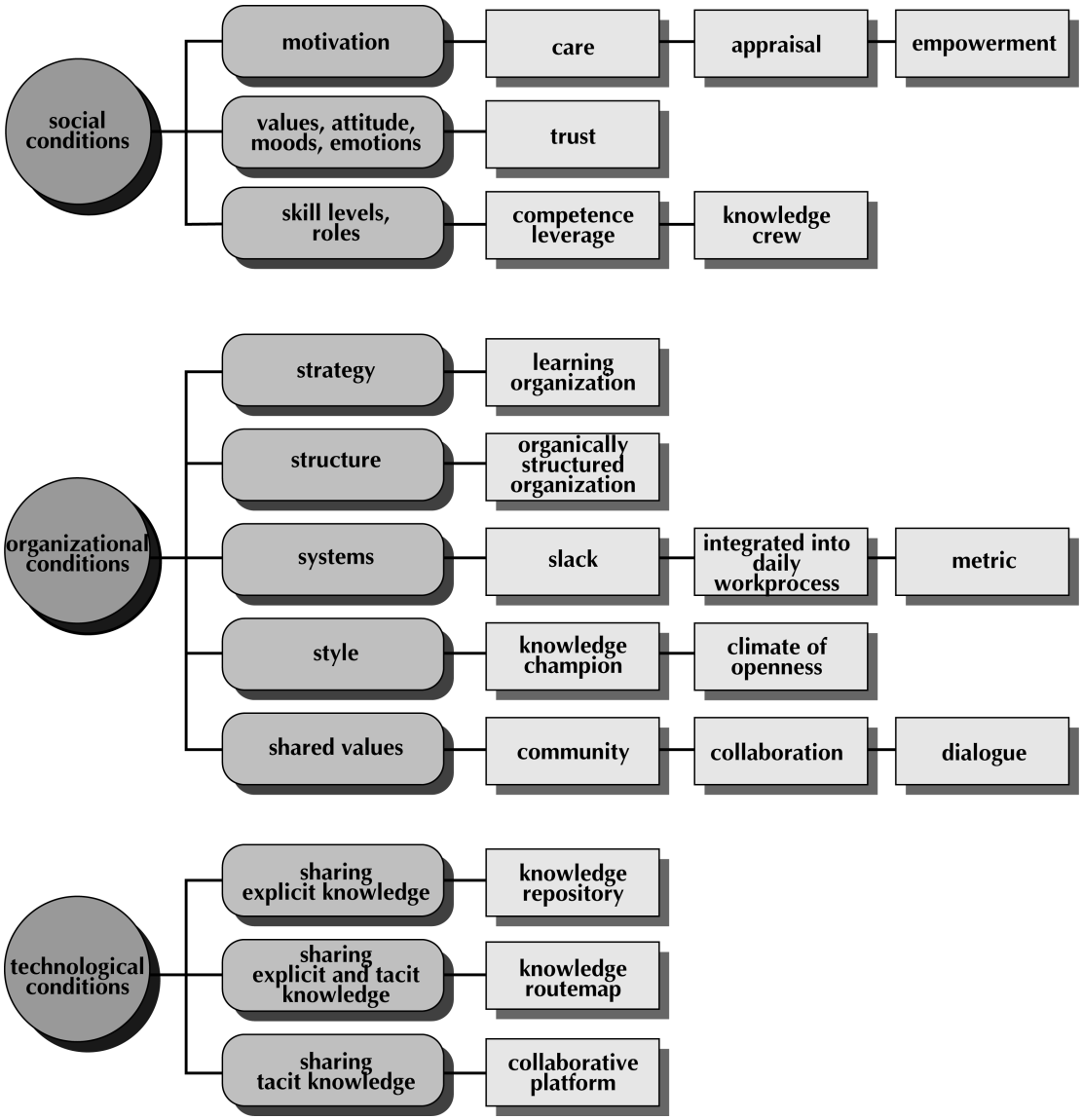


Figure 5.1: Overview of enabling social, organizational, and technological conditions

5.2.1 Motivation: *care, appraisal, and empowerment*

In Subsection 3.5.1 (on page 31) we observed that the motivation or drive of a person to contribute to and participate in knowledge sharing is influenced by the characteristics of that individual, the situation, and their interaction. The theory of Maslow (1968) argues that the behavior of people is determined by needs. Conditions can be created affecting these needs in order to influence motivation of individuals. Therefore these conditions can be used to stimulate certain types of behavior like sharing of knowledge and discourage others like keeping valuable information to oneself.

In the descriptions of the cases in Chapter 4, more specifically in Table 4.1 and Table 4.2 (on page 51 and 62 respectively) we saw that, related to motivational aspects, three issues may influence knowledge sharing processes: by giving genuine attention to employees, to create incentives in order to reward desired behavior, and by allowing the individual more autonomy in his or her way of working. Based on this observation and the existing literature (Davenport, 1994; Long, 1997; Elliott, 1997a; Gephart et al., 1996; Hansen et al., 1999;

Jarvenpaa and Ives, 1994; Krogh, 1998; Nonaka and Takeuchi, 1995; O'Dell and Jackson Grayson, 1997; Quinn, 1992; Schein, 1996a; Trussler, 1998; Ulrich, 1998; Wilson, 1996) we describe the following — motivation related — conditions: care, appraisal, and empowerment.

5.2.1.1 Care

Krogh (1998) defines care as "serious attention (heed), a feeling of concern and interest. … To care for someone is to help her to learn, to help her to increase her awareness of important events and their consequences, and to help nurture her personal knowledge creation while sharing her insights." In an organizational context care has the meaning of warm, genuine interest of one employee in another employee, giving attention and helping him or her whenever needed, and stimulating his or her personal growth and development. Regularly the person who cares does this in a kind of protective spirit and has some seniority over the person who is cared about, like a fruitful relationship between a manager and her employees or between an expert and his trainees. Ulrich (1998) uses a correlated concept: concern for people. This concept is related to the attitude an organization may bear towards its employees, to "ensure that each individual is treated with dignity." Because care functions at the interpersonal relationship level we feel it will be of more relevance to knowledge sharing than the concept of concern.

<u>In what way may care enable knowledge sharing</u>
Care may enable knowledge sharing because the warm, social relationships it brings into being can constitute a foundation for people to be open to thoughts of other people, to engage in a dialogue with each other, and to reconsider one's own basic beliefs.

<u>Which drivers may trigger or influence care</u>

- The awareness that the (feeling of) well-being of an employee may strongly influence the quality and quantity of his or her output and the realization that this feeling may reflect on his or her surroundings within the organization.
- The lack of a strong competitive culture in the organization, for this may emphasize individual achievements.
- The existence of people in the organization capable of empathy may create care for other people. Krogh (1998) defines empathy as: "the attempt to put yourself in another's shoes: understanding his particular situation, interests, skill level, history of successes and failures, and future opportunities and problems."
- When people have an attitude of genuine interest in other people to help them grow this may result in more care in the organization.

5.2.1.2 Appraisal

Krogh (1998) observes: "When organizational members' futures with the company are dependent on the expertise they demonstrate, and not on the extent to which they actually help others, individuals will attempt to build up and defend their own hegemonies of knowledge. Spending time listening to others in an effort to understand their viewpoints is seen as a waste of time. In this competitive context, sharing more knowledge than necessary will lead to reduced power and influence. The individual will not be motivated to make his knowledge explicit or shareable unless there are clear transactions that would

make this favorable. He will judge the knowledge sharing as a transaction, knowledge shared being based on expected returns."

It is noted by Alavi and Leidner (1999) that "Firm-wide Knowledge Management Systems usually require profound cultural renovations. This is because traditionally, organizations have rewarded their professionals and employees based on their individual performance and know-how. In many organizations, a major cultural shift would be required to change their employees' attitudes and behavior so that they willingly and consistently share their knowledge and insights. An effective way to motivate knowledge sharing is through the organizational reward and incentive mechanisms."

Senge (1992) argues that people should redesign their mental models — 'constructed' in traditionally competitive environments — in order to support sharing and transfer of knowledge and expertise. People need to be stimulated and motivated to do so, they need incentives to participate in the knowledge sharing process (Hansen et al., 1999; Trussler, 1998; Elliott, 1997a). From the perspective of an employee, contributing knowledge may be considered as sacrificing some of their personal power and therefore knowledge will not be shared easily (Davenport, 1994).

To stimulate codification of knowledge, Hansen et al. (1999) suggest that "managers need to develop a system that encourages people to write down what they know and to get those documents into the electronic repository. And real incentives — not small enticements — are required to get people to take those steps. In fact, the level and quality of employees' contributions to the document database should be part of their annual performance reviews." Incentives to stimulate the exchange of tacit knowledge may take the form of rewarding people who share knowledge directly with other people, offer help to colleagues, the degree of high-quality person-to-person dialogue a person has had, the quality of new solutions they published, the number of their responses to requests for information, their behavior in teams, and whether they adopt best practices (Hansen et al., 1999; Quinn, 1992; O'Dell and Jackson Grayson, 1997).

Appraisal may use a range of instruments, for instance more autonomy, more resources, virtual credits ('knowledge miles'), attractive assignments, boosting someone's ego, time, position, or money. These instruments should not only recognize and reward individual performance (often considered as the traditional way) but collective improvement as well. Jarvenpaa and Ives (1994) argue: "the performance of the knowledge worker will be much more closely tied to his or her compensation. But compensation schemes must also be heavily oriented toward the success of the specific team as well as the specific individual. A detailed trail of team member activities will provide the ability to assess the relative contribution of each member to the team activities. In the network organization, human resource management is likely to be dispersed to empowered employees and problem-solving teams. Prior research has shown that when activities of the team members become highly interdependent and interwoven, only the team itself has enough knowledge of how the actions taken by the members relate to the results they have produced to carry out the team member development and evaluation activity."

Denning (2001) discussed a possible backfiring of "setting up any special system in which staff would be rewarded in some way for individual acts of knowledge sharing. … The reason was that once people saw that there was the possibility of getting a specific reward for sharing specific knowledge, such as enhanced personnel ratings or salary bonuses or

points or whatever, then the dynamic quickly developed that staff would only share if they received rewards or incentives. Spontaneous sharing of knowledge started disappearing, as staff hoarded their knowledge until an occasion or situation arose until they were able to claim a reward." Denning (2001) argues that appraisal should take place "into the general framework of personnel policy and incentives" that an organization employs, to send "signals to its staff as to what behavior is encouraged or discouraged."

In what way may appraisal enable knowledge sharing
Appraisal tries to change behavior of people: "people should consider the sharing of knowledge as an integral part of their working life" (Nevis et al., 1995). Appraisal rewards and stimulates such behavior. Appraisal of desired behavior may work best when this is related to the type of personnel: engineers probably react to different stimuli than sales people do.

Which drivers may trigger or influence appraisal

- The awareness that the behavior of people may need to be changed from the perception that 'information is power' into the maxim that 'sharing of information is strength'.
- The conviction "to make knowledge transfer a prominent criterion in the company's evaluation and compensation system, with high-profile rewards and recognition (not necessarily monetary) for significant contributions" (Trussler, 1998).
- The desire to adapt Human Resource policies and systems (incentives, rewards, and recognition) in order to promote sharing and teamwork in a lasting way.

5.2.1.3 Empowerment

Empowerment is involving people in the changes that will affect them (Schein, 1995; Ulrich, 1998). Wilson (1996) writes "The concept of expanding the capability of the individual to respond in an 'appropriate' manner to new situations allows for the possibility of decentralization of organizational control as management delegates the implementation of process improvement down the organizational hierarchy. The management will therefore allow lower-echelon staff 'to make judgments, allocate resources, and call for appropriate action when necessary'. … [The] vision is one of workers as self-empowered with a set of (computer-based) tools with which they can anticipate, comprehend, correct, and improve a complete operational process as opposed to its isolated parts."

According to Jarvenpaa and Ives (1994), two ways to empower employees are: conferring authority (accompanied by expertise and relevant information) and team organization (where no information differential exists among members — who are well socialized, trained, and informed employees — and where everyone acts on equal terms).

In what way may empowerment enable knowledge sharing
Empowerment may stimulate knowledge sharing because it emphasizes individual responsibility for reactions in response to new situations (people learn themselves in stead of being told what to do) and because of its team-focused way of working. Nonaka and Takeuchi (1995) believe that this may improve an individual's motivation to create new knowledge because the autonomous individual strives for personal development and growth and has the possibility to create his or her own concepts. Moreover, a prerequisite for knowledge

sharing seems to be a free flow of information and knowledge, something that can not be achieved when communication flows only follow the hierarchical structure.

Which drivers may trigger or influence empowerment

- The awareness that hierarchical communication flows get congested because of the increasing pace of change in the environment and that a solution may be found in enabling employees to make better and faster decisions on their own.
- The possibility of delivering information about organizational performance to the employees (Jarvenpaa and Ives, 1994).
- The availability of employees in the organization having the attitude, knowledge, and skills to understand and contribute to organizational performance (Jarvenpaa and Ives, 1994).

5.2.2 Values, attitude, moods, and emotions: *trust*

The personality of a person may be characterized through his or her values, attitude, and moods and emotions (see our elaboration in Subsection 3.5.1 on page 31). Values were described using a definition of Jones and George (1998): "Values are general standards or principles that are considered intrinsically desirable ends, such as loyalty, helpfulness, fairness, predictability, reliability, honesty, responsibility, integrity, competence, consistency, and openness." The — often not clearly articulated — values of a person may function as guiding principles in his or her way of doing.

The attitude of a person is probably based on his or her values and characteristics of the environment. Jones and George (1998) define attitude as: "(1) the knowledge structures containing the specific thoughts and feelings people have about other people, groups, or organizations and (2) the means through which people define and structure their interactions with others."

"Moods and emotions capture how people feel as they go about their daily activities, including interacting with other people; they are affective states or feelings that provide people with information about their ongoing experiences and their general state of being. The intensity of the affective state is a primary distinguishing feature between moods and emotions. Emotions are intense affective states that interrupt ongoing cognitive processes and behaviors and are tied to particular events or circumstances, whereas moods are less intense, pervasive, and generalized affective states that are not explicitly linked to particular events or circumstances" observe Jones and George (1998). Moods and emotions seem the visual aspect of an individual and manifest themselves on shorter time intervals than attitudes, which give the impression to be of a more continuous nature.

Conditions within the organization will have a limited influence on the personality of an individual. Some conditions may have an effect on a person's attitude however, which — in the long run — may affect the values of that person.

Considering Table 4.1 and Table 4.2 (on page 51 and 62 respectively) and following the literature (Jones and George, 1998; Krogh, 1998; Landry, 1992; Skyrme, 1998) we propose that — related to values, attitude, and moods and emotions of people — the prime condition that may help knowledge sharing is by trusting each other.

5.2.2.1 Trust

Trust is used to lower uncertainty regarding the behavior of other people or objects and supports sharing of ideas (Landry, 1992; Jones and George, 1998). In a continuous feedback loop, signals are interpreted that indicate whether the trust is justified. When other people or objects do not fulfill our expectations, trust can evaporate quickly and it takes a much longer time to restore (Skyrme, 1998).

Trust seems a — to some extent emotional — confidence in the reliability of a person or object with respect to past, current, and anticipated future behavior. Krogh (1998) observes: "In every encounter with another person, you establish some degree of trust in him. Your trust in some ways compensates for the knowledge you lack — you do not know all of his motives, his preferences, interests, or personal background, his opinion of you, his reactions to your conversations, his backing in the organization, his ability to honor the agreements the two of you have made and so forth." Jones and George (1998) add: "People often decide if they can initially trust someone by examining the feelings [conditioned by their values, formed by their attitude, and colored by their moods and emotions] they have toward that person."

Trust between people is best initiated through physical interaction with face-to-face contacts, "making a commitment 'eyeball to eyeball' has a more personal impact" (Skyrme, 1998). In organizations where its people are geographically dispersed, electronic communication can connect team members, but without trust geographical and organizational distances may turn into unmanageable psychological barriers (Jones and George, 1998).

<u>In what way may trust enable knowledge sharing</u>
Jones and George (1998) claim that "Scholars have widely acknowledged that trust can lead to cooperative behavior among individuals, groups, and organizations." Trust lays the primary basis for a social relation and may therefore be a prerequisite for people to share their ideas, information, and knowledge.

<u>Which drivers may trigger or influence trust</u>

- The awareness that trust between people may encourage the process of exchanging views, ideas, thoughts, information, and knowledge.
- People in the organization who — in order to enhance trust — can "show consistent behavior towards the other person over a period of time (with a minimum of surprise)" (Krogh, 1998).
- Jones and George (1998) suggest the ability of an organization "to create the setting within which trust can develop over time. Does the work environment and context promote positive attitudes and positive moods and emotions? Does the organizational culture endorse and encourage the expression of the values underlying trust? Are individuals given the opportunity to explore shared values? Does the organization's structure provide the appropriate set of task and reporting relationships that facilitates the development of positive attitudes and moods?"

5.2.3 Skill levels and roles: *competence leverage and knowledge crew*

As defined in Subsection 3.5.2 (on page 33) people in an organization may possess the following skill levels — depending on experience, task complexity, and productivity:

trainee, amateur, professional, specialist, and expert (Senge, 1999). In Subsection 3.5.2 we also explained that knowledge sharing may not only be influenced by the skill levels of the employees, but also by the role a person has in the organization. Following Davis (1998) four distinct roles were distinguished: knowledge users, the line knowledge manager, the competency knowledge manager, and the chief knowledge officer.

Conditions that influence skill levels and roles can be derived from Table 4.1 and Table 4.2 (on page 51 and 62 respectively) and the literature (Davis, 1998; Jarvenpaa and Ives, 1994; Morello, 2000; Nonaka and Takeuchi, 1995; Stata, 1989; Stewart, 1997a; Ulrich, 1998): increasing the ability of an employee (competence leverage) and the appointment of employees who have a specific responsibility for encouraging and improving knowledge sharing (a knowledge crew).

5.2.3.1 Competence leverage

Competence can be defined as the ability of a person to accomplish tasks (Weggeman, 1997). It is dependent on the professional knowledge, experience, natural talent, craftsmanship, and skills of the individual. In this respect Stata (1989) emphasizes: "the rate at which individuals and organizations learn may become the only sustainable competitive advantage, especially in knowledge-intensive industries." Competence leverage appears to be primarily affected by two factors, related to the individual and to the organization:

- The attitude the individual holds towards learning, one´s talents, and the development of his or her potential and skills. Edwards (1997) observes "learning requires self-criticism, humility, honesty and openness, the ability to welcome error as an opportunity to move forward rather than as a mistake to be concealed." In congruence with Subsection 1.3.1 (on page 4) learning is essential in coping with challenges posed by the environment. The ability of a person to accomplish tasks in that changing environment may also depend on the absorptive capacity of that individual (which indicates openness to change and innovation, and the capability or preparedness for being able to assimilate it and apply it: Brown, 1997).
- The organization that creates and maintains a climate to stimulate "an individual's propensity to adapt, to be flexible, and to be willing to continually learn new skills" (Jarvenpaa and Ives, 1994). Organizations have a wide range of possibilities to foster competence leverage, according to Morello (2000) they could "focus on matching opportunities to people, assigning strong coaches to professional development, designing and promoting continuous learning programs (apprenticeships, role playing, simulations, rotations, assignments), soliciting new ideas and redesigning work roles and responsibilities."

There are several ways to increase the competence of the people in the organization. Based on Ulrich (1998) we can distinguish between build (competence leverage on the job or through formal training), buy and bounce (selecting new employees and dismissing staff), and borrow (by using the competences of people from outside the organization).

Build

Based on an extensive survey (Mohrman and Finegold, 2000) the activities which are most useful in developing skills and knowledge appear to be (in order of usefulness): visiting with customers, suppliers, and partner companies; attending formal courses and programs; participating in external conferences and learning networks; struc-

tured on-the-job training; special assignments (e.g. participation on task teams); participating in company seminars, conferences, and learning networks.

Learning as part of people's regular work can be stimulated through challenging job assignments, coaching and mentoring, apprenticeships, versatility of employees, frequent job rotation (mobility within the organization), working in teams, project debriefings, and sabbatical leaves (Ulrich, 1998; Quinn et al., 1996; Krogh, 1998; Morello, 2000; Robinson, 1997; Kempen, 1999).

There are a variety of methods for formal training like (online) courses (individual or classroom oriented), correspondence courses, seminars, congresses, video and audio aids, and reference material (Darling, 1996). These methods can train people to apply the techniques of dialogue and discussion (to improve knowledge transfer skills), to access and contribute knowledge, to understand the knowledge routemap of the organization, to understand technology that supports knowledge sharing, to tackle a real business problem as a team (action learning: Ulrich, 1998), and to navigate and use structured and unstructured ever-growing information (in order to avoid information overload: Jarvenpaa and Ives, 1994).

Buy and bounce

Competence within the organization can be bought by acquiring new talent, i.e. by recruiting talented individuals from outside the organization and it can be bounced by dismissing employees who perform low or sub-par (Ulrich, 1998; Quinn et al., 1996). New employees bring outside knowledge and may question existing values, norms, and practices that on one hand may cause change and learning but on the other hand also may alienate internal employees already present.

Borrow

Competence can also be leveraged by borrowing expertise from people outside the organization, for example by hiring consultants, teaming with partner organizations, or conferring with customers (Ulrich, 1998). Their knowledge may be transferred to and adopted by employees of the organization.

In what way may competence leverage enable knowledge sharing

Competence leverage may stimulate knowledge sharing because creation and transfer of knowledge is intentionally encouraged. Competence leverage and competence management appears to be an influential condition for it may help to structure the process of improvement of a person's competencies and skills. Oldenkamp (2001a) observes that competence leverage is to be most effective when it focuses on increasing people's skills and competencies for knowledge sharing for example in the techniques of dialogue, discourse, story-telling, and discussion.

Which drivers may trigger or influence competence leverage

When an organization becomes aware that there is a transition in the main source of value creation from physical skill (manual labor) to intellectual capabilities (mental labor). In addition the organization may realize that its survival and competitive advantage is strongly influenced by the abilities of its employees and that continuous learning may help them (and therefore the organization) in coping with a changing environment.

5.2.3.2 Knowledge crew

In Subsection 3.5.2 (on page 33) we followed Davis (1995) and described roles of people in an organization related to knowledge sharing. Three of these roles can act as members of a knowledge crew:

- the line knowledge manager, who valuates new knowledge, organizes and classifies it;
- the competency knowledge manager, who defines procedures, policies, and reward systems that encourage knowledge sharing, creates and maintains the classification structure for each recognized competency, searches for new knowledge components within his or her competency scope, valuates, organizes and classifies them, maintains and refines existing knowledge components, and distributes the knowledge components;
- the chief knowledge officer, who is responsible "for the overall knowledge assets of a company" (Davis, 1998), who defines an organization-wide classification structure of knowledge components, and who secures the availability of an appropriate technology infrastructure.

Nonaka and Takeuchi (1995) consider the knowledge crew as "the project leaders of the organizational knowledge-creation process." It appears from Mohrman and Finegold (2000) that these roles should form an integral part of the business processes to realize their full potential. The knowledge crew structures and maintains a platform for creating and distributing knowledge to people and controls the quality and integrity of the knowledge components. They organize the knowledge repositories, they hunt for new appropriate knowledge, they valuate and classify the knowledge components, they support competence centers, and they encourage people to make (better) use of this platform (Stewart, 1997a).

<u>In what way may a knowledge crew enable knowledge sharing</u>
A knowledge crew may enable knowledge sharing because these employees have a specific responsibility for encouraging and improving the sharing of knowledge within the organization. The presence of employees specifically dedicated to encourage knowledge sharing may create a positive incentive to get the knowledge sharing process going. Attention must be given that eventually these responsibilities will be shared with all employees and that knowledge sharing will become an integral part of the way of working.

<u>Which drivers may trigger or influence a knowledge crew</u>
When an organization realizes its knowledge sharing efforts need an extra push that may come from especially appointed people, whose dedicated responsibilities are to stimulate the knowledge sharing processes.

5.3 Organizational conditions and enablers

In Subsection 3.6.1 (on page 34) we described the 7S framework by McKinsey as a model to characterize and analyze organizations. This model consists of seven interrelated organizational factors: strategy, structure, systems, staff, skills, style, and shared values. These factors form our guideline to describe the organizational conditions that enable knowledge sharing.

5.3.1 Strategy: *learning organization*

We mentioned in Subsection 3.6.1 (on page 34) that strategy, vision, and mission set the direction for an organization. An organization needs to create a knowledge vision to guide knowledge sharing activities and to encourage commitment from employees (Nonaka and Takeuchi, 1995; Senge, 1999; Fiol and Lyles, 1985). The strategy for knowledge sharing is build on the business strategy and should make clear in what way knowledge sharing can add value to the organization, internally and externally. According to Mohrman and Finegold (2000) a knowledge strategy gives employees an understanding of where the business is headed, what competences will be important in the future, and guides investment, outsourcing, and partnering decisions. This strategy should — as addressed by Prahalad and Hamel (1990) and Davenport et al. (1998a) — focus on collective learning in the organization through combination and coordination of skills, competences, and technologies supported by communication, involvement of people, a commitment to work across organizational boundaries, and a link to economic performance or industry value.

Based on the literature (Balasubramanian, 1996; Davenport et al., 1998a; Gephart et al., 1996; Geus, 1997; Hamel and Prahalad, 1994; Huber, 1991; Mason, 1993; Nonaka and Takeuchi, 1995) and our Table 4.1 and Table 4.2 (on page 51 and 62 respectively) we identify the learning organization as the key condition related to strategy.

5.3.1.1 Learning organization

In Subsection 1.3.1 (on page 4) we discussed organizations as learning organisms: "Organizations will need to evolve from mechanical routine based systems into adaptive, open, and learning organisms" (McGee and Prusak, 1996; Choo, 1995a; Stewart, 1997a; Malhotra, 1993). Geus (1997) argues: "The company must be able to alter its marketing strategy, its product range, its organizational form, and where and how it does its manufacturing. And once a company has adapted to a new environment, it is no longer the organization it used to be; it has evolved. That is the essence of learning." A learning organization is defined by Senge (1990) as an organization "where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning how to learn together."

We noted in Subsection 3.2.4 (on page 25) that organizations learn in order to improve their adaptability and efficiency during times of change (Balasubramanian, 1996). A learning organization has an enhanced capacity to learn, adapt, and change and sees every experience (like contact with a customer, information gathering about competitors, and new ways to solve problems) as an opportunity to improve (Hamel and Prahalad, 1994). A learning organization purposefully enhances and maximizes organizational learning to enable effective responses to a dynamic environment through knowledge creation, sharing, and use (Balasubramanian, 1996; Davenport et al., 1998a; Mason, 1993). Knowledge creation and sharing is a continuous and dynamic process involving interactions at various organizational levels. Organizational learning builds on knowledge creation and sharing by individuals. Learning at team, group, or organizational level "should be understood as a process that 'organizationally' amplifies the knowledge created by individuals and crystallizes it as a part of the knowledge network of the organization" (Nonaka and Takeuchi, 1995). This learning may go deeper than the ability to respond and adapt more effectively

to change: single loop learning is about adaptation and coping. Learning may also be generative and expand the capability of the organization: double loop learning is about transformation and creating (Senge, 1990; Huber, 1991; Schein, 1996a).

In what way may a learning organization enable knowledge sharing
In Subsection 3.2.4 (on page 25) we reported that "Organizational learning means the process of improving actions through better knowledge and understanding" (Fiol and Lyles, 1985). Organizational learning may result in revised understanding, which may lead to different actions in the future. "The fundamental change is in cognition, not in observed actions" (Mason, 1993). As organizational learning does not need to result in immediate observable changes in organizational behavior (Huber, 1991; Mason, 1993), it can be defined as a process of gaining knowledge and developing skills to improve future organizational performance. "A learning organization is an organization that has an enhanced capacity to learn, adapt, and change. It's an organization in which learning processes are analyzed, monitored, developed, managed, and aligned with improvement and innovation goals. Its vision, strategy, leaders, values, structures, systems, processes, and practices all work to foster people's learning and development and to accelerate systems learning" (Gephart et al., 1996).

Which drivers may trigger or influence a learning organization
A desire of an organization to improve the adaptability to and efficiency in a dynamic environment and a willingness to change into a learning organization.

5.3.2 Structure: *organically structured organization*

We described structure in Subsection 3.6.1 (on page 34) as the way in which tasks, responsibilities, coordination, and communication are organized. To facilitate knowledge sharing the organizational structure should be focused on giving access to repositories of information and knowledge and on supporting the sharing of knowledge between people, teams, and organizational units. Jarvenpaa and Ives (1994) identify the importance of an appropriate organizational structure as follows: "By design, traditional organizations are structured to protect and control information. Individuals are seen as owners of information. Their power arises from the data that they own. Individual managers are rewarded for what they know that others do not know, rather than what the manager contributed to others' learning and the overall organizational memory."

The condition we describe for structure is, in accordance with the literature (Cohen, 1991; Edwards, 1997; Fiol and Lyles, 1985; Gephart et al., 1996; Glynn, 1996; Jarvenpaa and Ives, 1994; Stebbins and Shani, 1998) and the findings of Table 4.1 and Table 4.2 (on page 51 and 62 respectively): an organically structured organization, that is an organization that reshapes itself as the environment changes.

5.3.2.1 Organically structured organization

In Subsection 1.3.1 (on page 4) we mentioned the concept of the organization as a learning organism: living systems who are dependent on the environment in which they live. Such organizations are structured as open, adaptive systems that live in constant interaction with their surrounding. Because this structure ought to be able to deal with greater amounts of

uncertainty it tends to be organic rather than mechanistic (Glynn, 1996; Fiol and Lyles, 1985; Stebbins and Shani, 1998): they consist of "small, globally dispersed ad hoc teams or independent organizational entities performing knowledge or service activities. They reshape themselves dynamically as customer requirements change or as the environment evolves" (Jarvenpaa and Ives, 1994).

This flexible, organic structure supports and encourages — cross-functional — teamwork, small and interlinked (networked) task-oriented organizational units, free information flow, participative design, empowerment, evolutionary development, flatter hierarchy, knowledge distribution, and minimal formalization and bureaucracy. These characteristics are all favorable to cooperation, collaboration, innovation, reflective action-taking, and learning within the organization (Edwards, 1997; Gephart et al., 1996; Fiol and Lyles, 1985; Powell and Dent-Micallef, 1997; Sol, 1982; Balasubramanian, 1996).

In what way may an organically structured organization enable knowledge sharing
An organically structured organization may support knowledge sharing for its structure is especially designed for a free flow of thoughts and ideas to encourage innovation and to generate new insights within small autonomous teams (that is: knowledge is created and shared) to cope with changes in the environment.

Which drivers may trigger or influence an organically structured organization
When leaders of an organization realize they "need to intentionally design the organization and its processes to foster accessing, creating, growing, applying, leveraging, and protecting knowledge for competitive advantage" (Mohrman and Finegold, 2000).

5.3.3 Systems: *slack, integrated into daily workprocess, and metric*

Systems were described in Subsection 3.6.1 (on page 34) as the compilation of procedures and directives that facilitate the business processes and activities. Emphasis is thereby shifting from the traditional systems for transaction processing to systems that facilitate and implement change, create practical knowledge, facilitate scanning of the environment, provide access to business information, and facilitate the dissemination of information and knowledge (Gephart et al., 1996) and to systems "that support competencies for communications building, people networks, and on-the-job learning" (Malhotra, 1997).

With respect to systems, we learn from the literature (Bair and Hunter, 1998; Brown, 1997; Davenport et al., 1998a; Davis, 1998; Elliott, 1997a; Fahey and Prusak, 1998; Gephart et al., 1996; Nevis et al., 1995; Schein, 1995a; Ulrich, 1998; Vogel, 1996), combined with what we deduce from the descriptions of the cases in Chapter 4 (see Table 4.1 and Table 4.2 on page 51 and 62 respectively) that three themes are relevant to knowledge sharing:

- employees need to have time to be able to reflect, to increase competences, and to share knowledge;
- that knowledge systems should be embedded in daily work processes itself and not on top of that; and
- that there should be a way to measure the effectiveness of knowledge sharing.

Therefore the following conditions are described: slack, system integrated into daily workprocess, and metric. Because most systems today are realized by means of information

and communication technology we also refer to Section 5.4 (on page 84) where we present conditions that are more technology related.

5.3.3.1 Slack

Morello (2000) reports: "According to Gartner Research projections, the percentage of an individual's work product that depends on collaborative input will increase from 25 percent in 2000 to 50 percent in 2010, a conservative estimate. On the rise will be time required for collaboration, meetings, and coordinated action. On the decline will be 'face time' — i.e., same-time, same-place meetings — and, most disturbing, quiet time for knowledge workers to deliver individual output. Dangers lie in simply adding collaborative work to the output rather than rebalancing workloads and redefining metrics to embrace collaborative work product. Burnout, boycotting, and loss of morale will inevitably occur." Employees are busy, and sharing of knowledge takes time.

Garvin (1993) reasons that "The first step [for an organization] is to foster an environment that is conducive to learning. There must be time for reflection and analysis, to think about strategic plans, dissect customer needs, assess current work systems, and invent new products. Learning is difficult when employees are harried or rushed; it tends to be driven out by the pressures of the moment. Only if top management explicitly frees up employees' time for the purpose does learning occur with any frequency." This is also observed by Mohrman and Finegold (2000): "the time for needed knowledge exchange is repeatedly crowded out by the pressure to meet the latest deadline." We infer that knowledge sharing should not be stacked on top of everything else. Organizations therefore help their knowledge sharing activities by allowing their employees slack time to be reflective, reframe issues, and learn new competences (Schein, 1995a and 1996a; Brown, 1997; Ulrich, 1998; Beath, 1991).

<u>In what way may slack enable knowledge sharing</u>
Slack may enable knowledge sharing because it allows people in an organization to use time for experimenting with new processes and systems, for reflectivity, and for entering into dialogues with other people.

<u>Which drivers may trigger or influence slack</u>
When an organization becomes aware that its people are having difficulties in making the time available for knowledge sharing.

5.3.3.2 Integrated into daily workprocess

Systems may support knowledge sharing best when they do not create an extra burden for the user in his or her daily operations and therefore ought to work seamlessly with other elements of the daily workprocess. Knowledge sharing should be tightly integrated with the business processes, organizational routines, and activities (Vogel, 1996; Gephart et al., 1996). In this way knowledge sharing does not become another nuisance or cause a change in the way of working, but it will help people to achieve their work objectives because, as Davis (1998) argues, the day-to-day core business processes provide the primary context for knowledge use — and capture.

In what way may system integrated into daily workprocess enable knowledge sharing
When systems for knowledge sharing are integrated into the day-to-day business processes they transparently support using and capturing explicit knowledge. In this way they also offer a tangible advantage for the people in their way of working.

Which drivers may trigger or influence system integrated into daily workprocess
When an organization wants to introduce a system to support knowledge sharing activities and it realizes that users will not use the system if their question of 'How will this system improve my day' can not be answered satisfactory.

5.3.3.3 Metric

To gain insight in the effectiveness of activities connected to knowledge sharing there ought to be a way to measure this 'Return On Knowledge'. Elliott (1997a) observes "Because someone will ultimately question whether benefit is being derived from spending on knowledge management, the value and impact should be monitored from the beginning. But, measuring and managing impact is difficult." The value of knowledge sharing is hard to express in financial terms, but it can be reflected in the book value and in the operational benefits; i.e. in the value of and return on knowledge sharing. Some aspects of organizational performance that can be influenced are (Alavi and Leidner, 1999): "customer satisfaction, product/service innovations, time to market, cost savings, competitive positioning, and market shares." Lucier and Torsilieri (1997) recommend "three tiers of metrics:

- at the highest level, bottom-line financial impact measured in terms of improvements in specified lines of the income statement or balance sheet;
- operating performance metrics, which identify the aspects of performance where learning is expected to accelerate the rate of improvement;
- direct measures of learning to insure that knowledge is being created and used and that change is occurring (for example, the number of active participants in knowledge communities, customers impacted by the use of knowledge, or the number of people trained).

The usual sequence in which to define the metrics is middle-up-down, where the middle metric is the measure a company is targeting for improvement, the up metric charts the financial impact and the down metric is the learning measure that a company wants to keep track of."

In what way may metric enable knowledge sharing
Metric can support knowledge sharing activities because, following Gephart et al. (1996), it can provide indicators of the organization's progress in this field, which may justify the investments done, may fuel enthusiasm, and it can identify areas for improvement.

Which drivers may trigger or influence metric
When a specific knowledge sharing project is executed for a weak performing but important business process (perhaps because the relevant employees do not share knowledge) and the organization wants to measure whether the efforts produce satisfactory results.

5.3.4 Staff and skills

In Subsection 3.6.1 (on page 34) we distinguished staff and skills as two possible dimensions of an organization — according to the 7S framework of McKinsey. There we defined the dimension staff as the different types of people in an organization, their motivation, skill levels, and roles, and we related the dimension skills to competences of people.

Therefore we refer to Section 5.2 (on page 65): "Social conditions and enablers" for a description of conditions we associated with these two dimensions.

5.3.5 Style: *knowledge champion and climate of openness*

In the section on organizational dimensions (Subsection 3.6.1 on page 34) we described style as patterns of behavior characteristic for topmanagement of the organization. Topmanagement may play an important role in knowledge sharing because they can set an example of the needed behavior and can stimulate and facilitate the needed change in ways of working. In this respect Senge (1990) formulates the role of topmanagement as follows: "In a learning organization, leader's role differ dramatically from that of the charismatic decision maker. Leaders are designers, teachers, and stewards. These roles require new skills: the ability to build shared vision, to bring to the surface and challenge prevailing mental models, and to foster more systemic patterns of thinking. In short, leaders in learning organizations are responsible for *building organizations* where people are continually expanding their capabilities to shape their future — that is, leaders are responsible for learning."

Following the literature (Balasubramanian, 1996; Beath, 1991; Davenport et al., 1998a; Elliott, 1997a; Fahey and Prusak, 1998; Mohrman and Finegold, 2000; Nevis et al., 1995; Senge, 1990; Skyrme, 1997; Stata, 1989; Trussler, 1998; Ulrich, 1998; Weggeman, 1997) and examining the Table 4.1 and Table 4.2 (on page 51 and 62 respectively) we can identify two aspects in style that may help knowledge sharing: there has to be a leader who actively and vigorously promotes his or her personal vision for knowledge sharing and in the organization there should be a suitable climate present that nurtures the desired behavior. Therefore we describe the following conditions: the knowledge champion and a climate of openness.

5.3.5.1 Knowledge champion

A knowledge champion (or sponsor) is a member of topmanagement who understands the need for knowledge sharing and realizes how it can leverage the performance of the organization. He or she has the authority, the clout, and can command the needed resources (like people and budget) to bring about the necessary organizational change (Elliott, 1997a). Usually a knowledge champion has a strong personal drive and the required skills to forcefully — and visibly — overcome hurdles in order to ensure success (Beath, 1991): "Champions are more than ordinary leaders; they are more like *transformational leaders* who inspire others to transcend self-interest for a higher collective purpose." By continuously and passionately communicating his or her vision a knowledge champion gives employees a sense of direction and helps to build a strong foundation of purpose and core values in relation to the strategy of the (learning) organization (Nonaka and Takeuchi, 1995;

Ulrich, 1998). Employees need to be deeply convinced that (the implementation of this vision of) knowledge sharing is an improvement to the organization and to themselves.

In what way may a knowledge champion enable knowledge sharing
Because of his or her convinced commitment to knowledge sharing and therewith related activities, a knowledge champion may stimulate knowledge sharing directly. The example behavior of the knowledge champion and other members of topmanagement may bear influence in changing the organization in the desired direction. Hope and Hendry (1995) observe: "A factor that also hampered the implementation of the new culture was the inability of some managers to live out and demonstrate the required behavior. While this cannot be seen as purposeful resistance as such, nevertheless it was a significant block on the cultural change process."

Which drivers may trigger or influence a knowledge champion
At least one member of topmanagement should have a mindset that knowledge sharing is about fostering a new set of behaviors at all levels of the organization (Mohrman and Finegold, 2000; Weggeman, 1997).

5.3.5.2 Climate of openness

We wrote in Subsection 3.6.2 (on page 36) that it is important to have the right organizational climate in order for people to create, reveal, share, and use knowledge (Davenport et al., 1998a; Choo, 1995). A climate of openness can be such a climate as it may improve a free exchange of opinions, ideas, thoughts, information, and knowledge in the organization. Stata (1989) defines openness as "a willingness to put all the cards on the table, eliminate hidden agendas, make our motives, feelings, and biases known, and invite other opinions and points of view." Such a climate may, according to Choo (1995), influence the attitude of people to obtain "an open-mindedness to deal with the unfamiliar and the unfavorable, and the boldness to experiment and innovate": inquiry, dialogue, creativity, experimentation, and risk-taking are encouraged (Gephart et al., 1996; Powell and Dent-Micallef, 1997). Characteristics of a climate of openness are the following (Nevis et al., 1995):

- accessibility of (operational, business, and strategic) information;
- open and candor communications within the organization and free (horizontal and vertical) oral and written information flows;
- problems, errors, and lessons-learned are shared, not hidden;
- debate and conflict are acceptable ways to solve problems;
- abundant opportunity to meet with other people and groups;
- people have the freedom to express their views and diversity of views is stimulated;
- fear of failure is minimized and "failures are treated as opportunities for learning, rather than as mistakes that must be punished" (Mohrman and Finegold, 2000).

In what way may a climate of openness enable knowledge sharing
A climate of openness may enable knowledge sharing in the organization because it encourages a free and uninhibited exchange of opinions, ideas, thoughts, information, and knowledge. Political and competitive reasons in an organization may have a negative impact on a climate beneficial for knowledge sharing.

Which drivers may trigger or influence a climate of openness
A trigger to create a climate of openness may be the awareness that communication flows are not facilitated but in fact impeded by the organization's culture, structure, and systems (Fahey and Prusak, 1998).

5.3.6 Shared values: *community, collaboration, and dialogue*

Shared values or culture were described in Subsection 3.6.1 (on page 34) as the shared beliefs and assumptions — imposed by the values, norms, and practices of the organization — that guides (conscious or unconscious) organizational members in their actions and in interpreting events and situations (Landry, 1992). In Subsection 3.6.2 (on page 36) we wrote: "A culture is a set of basic tacit assumptions about how the world is and ought to be that a group of people share and that determines their perceptions, thoughts, feelings, and, to some degree, their overt behavior" (Schein, 1996b). Culture is based on shared history, expectations, unwritten rules, and social mores that influences organizational behavior.

Literature suggests that culture plays an important part in knowledge sharing (Bair, 1997; Darling, 1996; O'Dell and Jackson Grayson, 1997; Elliott, 1997a; Fiol and Lyles, 1985; Gephart et al., 1996; Knapp and Yu, 1999; Powell and Dent-Micallef, 1997; Schein, 1996a; Trussler, 1998) and when we relate those findings to our case descriptions addressed in Table 4.1 and Table 4.2 (on page 51 and 62 respectively) we observe that sharing of knowledge is a social interaction that only can take place when people value building on each other's thoughts and are willing to share their own insights. In view of this we describe the following three conditions relevant to knowledge sharing: community, collaboration, and dialogue.

5.3.6.1 Community

Geus (1997) observed: "How does an organization — as distinct from an individual learn? Birds can help us answer that question. Consider the work of Allan Wilson, the late professor of biochemistry and molecular biology at the University of California at Berkeley. According to Wilson's hypothesis, an entire species can improve its ability to exploit the opportunities in its environment. … Birds that flock learn faster. So do organizations that encourage flocking behavior. … The organization must encourage those people to interact with others." This interaction is underlined by Nonaka and Takeuchi (1995): "our theory of knowledge creation is anchored to the very important assumption that human knowledge is created and expanded through the social interaction between tacit knowledge and explicit knowledge. The quintessential knowledge-creation process takes place when tacit knowledge is converted into explicit knowledge" and by Tenkasi and Boland (1996): "The overall organizational knowledge base emerges out of the process of exchange, evaluation and integration of knowledge. Like any other organizational process, it is comprised of the interactions of individuals and not their isolated behavior."

Stewart (1997) argues "a company needs to foster teamwork, communities of practice, and other social forms of learning." These communities consist of individuals from diverse and possibly dispersed organizational units who have a sense of cohesion (a feeling of identity and belonging: Andriessen, 2001) among them and are self-motivated to achieve their business goals. They "form virtual relationships with other people working on similar

projects" (Gephart et al., 1996). Inkpen (1996) defines a community of practice "as a group of individuals that is not necessarily recognizable within strict organizational boundaries. The members share community knowledge and may be willing to challenge the organization's conventional wisdom. Communities emerge not when the members absorb abstract knowledge, but when the members become 'insiders' and acquire the particular community's subjective viewpoint and learn to speak its language." Communities are mechanisms and platforms for the exchange of experiences, ideas, views, and thoughts between people.

In what way may community enable knowledge sharing
Communities bring together people to discuss, review, and debate shared problems; they connect people with shared interests so they can cross-fertilize their personal experiences, solutions to problems, information, and knowledge.

Which drivers may trigger or influence community
When it is perceived by the organization that social or collective intelligence bears more importance and value to the organization than individual knowledge and skills.

5.3.6.2 Collaboration

Strongly related to community is collaboration. People share activities, processes, develop products together, and share responsibility. Qureshi et al. (2002) describe that "The act of collaboration is the act of shared creation and/or discovery in which two or more individuals with complementary skills interact to create shared understanding that none had previously possessed or could have come to on their own." Especially when the work is done through forming and disbanding teams on a project basis, working relationships do not develop as a product of interaction over longer time periods anymore, and attention should be given to the way in which knowledge is shared between team members (Cross et al., 2000). Collaboration is more than working together on the basis of compensation for help received in the past or in anticipation of help needed in the future (Jones and George, 1998). Duffy (1996) observes the following difference between working together (cooperation) and collaboration: "*Cooperate*. Work or act together, in company or in conjunction with each other, implies harmony but not necessarily shared risk and benefit. *Collaborate*. Work jointly, share work with each other, implies equal division of risk and benefit." Long (1997) characterizes this perhaps even stronger: "A sense of collective responsibility leads employees to go to great lengths to avoid letting colleagues down, frequently offering help to those in other departments, even though it burdens their own work. When norms and practices promote collaboration between functions and operating units, interactions are much more likely to create new organizational knowledge and apply it more effectively."

Qureshi et al. (2002) refine the notion of collaborative effort into three levels: *collective effort* — "people work on their own, group productivity is simply the sum of individual efforts"; *coordinated effort* — "people make individual efforts, but they have critical handoff points"; and *concerted effort* — "all members must make their effort in synchrony with other members."

In what way may collaboration enable knowledge sharing
Knowledge sharing may be enabled by collaboration in the way people develop their relationships with each other. This means working closely together in which relationships may develop that are based on trust and the drive to help each other. This may lead to

openness towards the other persons and the acceptance of their ideas, views, and thoughts. It may be hard to find a balance between a fair rewarding of individual and team performance.

Which drivers may trigger or influence collaboration
The recognition that collaboration — characterized by helpfulness and shared responsibility — frequently turns feeble individual efforts into team successes.

5.3.6.3 Dialogue

Senge (1992) notes that the Greek interpreted *dialogos* as a free flow of thoughts within a group of people, which created the possibility of enlightenment that could not be attained on an individual basis. Through free horizontal and vertical communication flows in an organization mutual dependencies within and across organizational functions and units may increase. This allows for more frequent and elaborate communications among unrelated interests, and stimulates mutual exploration across sub-culture boundaries (Powell and Dent-Micallef, 1997; Schein, 1996a). Through this multiplexity (a multiplex communication flow is one in which multiple facets of life or a situation are discussed: Brown, 1997) a context and atmosphere for knowledge sharing is created because people put forward their beliefs and ideas that are normally kept to oneself (Tenkasi and Boland, 1996).

As explained in Subsection 3.2.1 (on page 21) knowledge is understood and interpreted from an individual understanding of the world and bears a more personal than universal character. In Subsection 3.2.3 (on page 22) we mentioned that the sharing of (tacit) knowledge takes place in social interaction among people (Nonaka and Takeuchi, 1995) through a process of dialogue which explores multiple viewpoints in order to create a common (not necessarily equal) and understood perspective on the universe of discourse: a shared context (Tenkasi and Boland, 1996; Balasubramanian, 1996; Fahey and Prusak, 1998). Dialogue, as used by Senge (1992) and also noted in Subsection 3.2.3, can be seen as an example of mutual perspective taking that moves beyond discussion and allows the exploration of complex or difficult issues from many different viewpoints. Dialogue creates a shared context and offers groups of people the possibility to gain new insights and to share knowledge (Fahey and Prusak, 1998; Tenkasi and Boland, 1996).

In what way may dialogue enable knowledge sharing
Dialogue may enable knowledge sharing because it creates shared context in which people can understand each other's mental models and view of the world.

Which drivers may trigger or influence dialogue
The awareness that knowledge exists ultimately within individuals and that constructive group processes may make this knowledge available to other members of the organization.

5.4 Technological conditions and enablers

We argued in Subsection 3.7.1 (on page 37) that the role of information and communication technology will expand from transaction processing to the support of information and knowledge sharing and that information and communication technology moves from supporting pure computational activities towards supporting coordination activities and

facilitation of interpersonal and group communication, thereby removing barriers of time and location on service and coordination (Keen, 1993).

Continuing this view, we argued in Subsection 3.7.2 (on page 39) that: "A major objective of information and communication technology in facilitating knowledge sharing is to connect people with other people or with explicit knowledge. … Therefore an information and communication technology infrastructure is needed that supports the creation, structuring, accessing, and using of knowledge." We also mentioned in Subsection 3.7.2 three related areas in which information and communication technology may enable knowledge sharing: by sharing of explicit, of tacit, and of both tacit and explicit knowledge. If we relate these areas with the literature (Anderson and Smith, 1998; Balasubramanian, 1996; Bontis, 1996; Currie, 1997; Darling, 1996; Davenport, 1994 and 1996; Davenport et al., 1998a; Duffy, 1996; Elliott, 1997 and 1997a; Gephart et al., 1996; Hofte, 1998; Jarvenpaa and Ives, 1994; Malhotra, 1997a; McGee and Prusak, 1996; Mohrman and Finegold, 2000; Vogel, 1996; Vreede and Briggs, 1997) and our findings in Chapter 4 as laid down in Table 4.1 and Table 4.2 (on page 51 and 62 respectively) we obtain the following technological enablers for knowledge sharing: knowledge repository (for sharing explicit knowledge); knowledge routemap (for sharing explicit and tacit knowledge); and collaborative platform (for sharing tacit knowledge).

5.4.1 Technology for sharing explicit knowledge: *knowledge repository*

Information and communication technology for sharing explicit knowledge tries to ensure (see Subsection 3.7.2 on page 39 for an elaboration on possible functionalities) to have information, documents, and explicit knowledge components online, indexed and mapped, with easy access and accurate retrieval for all users. As mentioned in Appendix C (on page 215) several tools offer this functionality: integrated document management, document imaging, decision support systems, data warehouse, data mining, business intelligence, Internet, and intranet. These tools may capture and store information and explicit knowledge into online knowledge repositories that can be seen as electronic (digital) libraries. They will also facilitate access to, and distribution of, the content of these repositories.

Knowledge repositories hold collections of knowledge components that have a structured content like descriptions of best practices, information from business applications, lessons learned, manuals, reports and articles, or customer related databases (which may hold information about customer inquiries and needs, sales presentations, reports, engagement information, and competitor analysis: Elliott, 1997a). A content classification scheme or taxonomy is used to organize the knowledge repositories to facilitate grouping, sorting, visualization, searching, publication, manipulation, refinement, and navigation.

<u>In what way may a knowledge repository enable knowledge sharing</u>
Knowledge sharing may be enabled by knowledge repositories because these repositories hold information and explicit knowledge that can be easily accessed and used by people in the organization. Their major shortcoming seem that they offer barely any support for the tacit-to-explicit knowledge conversion (the externalization mode we described in Subsection 3.2.3 on page 22).

Which drivers may trigger or influence a knowledge repository
A trigger for knowledge repositories may arise when an organization desires to codify experiences with customers, production, services, or projects to prevent other people from losing time in dealing with a similar situation.

5.4.2 Technology for sharing explicit and tacit knowledge: *knowledge routemap*

Information and communication technology with an emphasis on sharing of both tacit and explicit knowledge can be found in knowledge routemaps. Knowledge routemaps are guides, directories, or pointers to an organization's internal and external information and knowledge sources — both tacit and explicit. Several tools that are mentioned in Appendix C (on page 215) can offer knowledge routemaps: intranet, online learning, and knowledge routemaps and directories. These tools also may aid in codification or capturing of tacit knowledge or in 'nuggetizing' (to discover units of knowledge in potentially relevant content).

Knowledge routemaps may provide pointers to sources of knowledge that can include people with a special expertise (a 'yellow pages' service or skill profiling system which helps locating people by expertise, experience, community, skills, the projects they are currently working on or were involved with, interests, and affiliation: Bair, 1997; Balasubramanian, 1996; Elliott, 1997a; Bontis, 1996) or may offer links to documents that describe research results, diagnostics tools (for example performance diagnostics, benchmarking methodology, questionnaires, and qualitative diagnostics: Elliott, 1997), or list frequently asked questions. O'Dell and Jackson Grayson (1997) observe the need for knowledge routemaps as follows: "In most organizations, the left hand not only doesn't know what the right hand is doing, but it also may not even know there is a right hand. There is a need to create and catalogue the corporate memory of an organization's expertise and abilities so others can build networks and new solutions together." Mohrman and Finegold (2000) argue that knowledge routemaps can also be linked to external knowledge sources through research partnerships, business alliances, industry associations, professional networks, benchmarking trips, and routine visits to customers and suppliers.

Another functionality that knowledge routemaps offer is that of online learning (computer based training), in which access to — possible interactive, multimedia — educational material (for example trainings, courses, 'cookbooks', lectures, video journals, and seminars) is given.

In what way may a knowledge routemap enable knowledge sharing
A knowledge routemap may enable knowledge sharing because its pointers to sources of knowledge (for example in 'yellow pages') help in finding the knowledge or expert needed.

Which drivers may trigger or influence a knowledge routemap
The awareness that wanted knowledge does exist in the organization but that it is hard to find may trigger the creation of knowledge routemaps.

5.4.3 Technology for sharing tacit knowledge: *collaborative platform*

We argued in Subsection 3.2.4 (on page 25) and in Subsection 3.7.1 (on page 37) that information and communication technology is able to support communication and collaboration between people irrespective of time and place constraints. Information and communication technology for sharing tacit knowledge seeks (see Subsection 3.7.2 on page 39) to improve coordination, communication, and collaboration between people, teams, or groups to transfer the knowledge from those who possess this to people who need or can use this (McGee and Prusak, 1996). This functionality can be realized through several tools (as mentioned in Appendix C (on page 215): e-mail and messaging systems, calendaring and scheduling, groupware (for instance electronic meeting system or group support system, chat systems, application sharing systems, shared whiteboards, collaborative virtual environments, video conferencing systems, electronic project rooms, electronic discussion systems [for example electronic bulletin boards, discussion databases, and newsgroups] and co-authoring systems), work management systems (or workflow management), process support systems, electronic forms, information and knowledge retrieval environments (intranet), and knowledge management systems (i.e. knowledge networks and discussions for electronic interaction).

A collaborative platform is a functionality of information and communication technology that — electronically — facilitates group or teamwork and collaboration regardless of time or geographic location. It is a distributed virtual environment that offers support for (Duffy, 1996):

- communication and multimedia interconnectivity between people (for example sending notes, videoconferencing, and having electronic meetings and interactive discussions);
- sharing and collaboration between people (for example co-authoring, group editing and reviewing, workflow management, brainstorming, mind mapping, and sharing of applications, documents, information, and thoughts);
- organizational coordination (for instance project management, to keep track of communications and activities of a group, decision support tools, natural language processing, corporate calendars and schedulers, and sense making — by incorporating information about context and meaning).

Vreede (1995) contends that electronic collaborative platforms have limited media richness and "represent a poorer medium in terms of information interpretation than, for example, face-to-face communication." However, collaborative platforms may encourage debate, dialogue, interaction, creativity, innovation, and sharing (Duffy, 1996) that otherwise would have been constrained by barriers of time and place. Real-time, face-to-face interaction is vital for establishing trust between people but essentially only necessary to initially build and periodically maintain relationships (Jarvenpaa and Ives, 1994; Davenport, 1994).

<u>In what way may a collaborative platform enable knowledge sharing</u>
A collaborative platform offers people the opportunity to interact and to exchange views and thoughts with each other.

<u>Which drivers may trigger or influence a collaborative platform</u>
When management realizes that it can have the best minds working together on issues, regardless of their locations. When an organization wants their employees to benefit from knowledge that colleagues possess (and who may not work in the vicinity).

5.5 Knowledge sharing processes and enabling conditions

In Table 5.1 below our descriptive conceptual model is given. This model relates the 19 social, organizational, and technological conditions we identified to the knowledge sharing processes (as formulated in Section 3.3 on page 26). For each condition we give a justification why we consider it is related to a certain knowledge sharing process. This justification is based on our findings from the cases we described in Chapter 4, the existing literature, and our descriptions of the conditions as stated in this chapter.

In the table below we have grouped the knowledge sharing processes into four clusters: the processes that create knowledge, the processes that manipulate explicit knowledge, the processes that offer access to or distribute explicit knowledge, and the processes that use knowledge, because their related conditions are identical.

	People	Organization	Technology
All identified conditions (see also Figure 5.1 on page 66)	appraisal, care, competence leverage, empowerment, knowledge crew, and trust	climate of openness, collaboration, community, dialogue, knowledge champion, learning organization, metric, organically structured organization, slack, and system integrated into daily workprocess	collaborative platform, knowledge repository, and knowledge routemap
Creating knowledge / tacit-to-tacit, tacit-to-explicit, explicit-to-explicit, and explicit-to-tacit	• appraisal: *encourages people to change their behavior in the desired direction of (collective) knowledge creation* • care: *brings people (and their ideas, thoughts, and beliefs) closer towards each other* • competence leverage: *underlines the favorable effect of continuous learning* • knowledge crew: *specifically encourages the sharing of ideas, information, and knowledge within the organization* • trust: *between people is a necessity for sharing their ideas, information, and knowledge*	• climate of openness: *enables a free exchange of opinions, ideas, thoughts, information, and knowledge* • collaboration: *develops strong relationships between people* • community: *fosters cross-fertilization of experiences, solutions to problems, information and knowledge* • dialogue: *creates a shared context for interpretation of another´s ideas and thoughts* • knowledge champion: *inspires knowledge sharing, removes organizational barriers* • learning organization: *emphasizes a strategy for adapting to a changing environment* • organically structured organization: *is specifically designed to allow a free flow of data, information, and knowledge* • slack: *creates time for people to experiment and reflect* • system integrated into daily workprocess: *transparently supports capturing knowledge in day-to-day operations*	• collaborative platform: *enables people to interact and exchange ideas, thoughts, and beliefs* • knowledge repository: *offers access to information and explicit knowledge* • knowledge routemap: *points to internal and external information and knowledge sources*
Valuation of new explicit knowledge; Organizing & classifying assessed explicit knowledge; Storing structured explicit knowledge; Maintaining and refining stored explicit knowledge	• knowledge crew: *organizes and maintains a knowledge infrastructure*	• learning organization: *implements and values a knowledge infrastructure* • metric: *identifies areas of the knowledge infrastructure to improve* • system integrated into daily workprocess: *facilitates organizing and maintaining the knowledge infrastructure*	• knowledge repository: *stores and manipulates information and explicit knowledge online*

	People	Organization	Technology
Distributing stored explicit knowledge; Accessing stored explicit knowledge	• competence leverage: *makes the necessary knowledge components available to improve the abilities of people to accomplish their tasks* • empowerment: *provides individuals with the information and knowledge components necessary for autonomous behavior* • knowledge crew: *stimulates usage of existing information and knowledge components*	• learning organization: *enhances the knowledge flow within the organization* • organically structured organization: *structure follows function; a free flow of data, information, and knowledge is facilitated* • system integrated into daily workprocess: *ensures that knowledge components form a transparent part of daily operations*	• knowledge repository: *offers mechanisms for retrieval and delivery of online knowledge components* • knowledge routemap: *offers online learning and access to knowledge components*
Using explicit and tacit knowledge	• appraisal: *encourages people to use existing information and knowledge components* • care: *stimulates people to use ideas, thoughts, and beliefs of other people* • competence leverage: *facilitates learning by doing* • empowerment: *enables people to use information and knowledge components to realize their autonomy* • knowledge crew: *helps people in using existing information and knowledge components*	• climate of openness: *enables an unrestricted use of knowledge components* • collaboration: *enhances usage of knowledge of other people* • community: *cultivates using knowledge from community members in actions and decisions* • dialogue: *broadens one's mental model to acknowledge the ideas, thoughts, and beliefs of another person* • knowledge champion: *shows example behavior in using knowledge components* • learning organization: *strives for a higher level of learning in the organization* • metric: *measures effectiveness of actions taken* • organically structured organization: *an organic structure encourages a democratic and free flow of data, information, and knowledge* • slack: *creates time for people to experiment with different styles and forms of knowledge components* • system integrated into daily workprocess: *transparently supports using knowledge in day-to-day operations*	• collaborative platform: *creates an online theater where people can become influenced by the ideas, thoughts, and beliefs of other people* • knowledge repository: *supplies information and explicit knowledge needed to accomplish actions* • knowledge routemap: *offers access to the knowledge of experts as needed in actions and decisions*

Table 5.1: Knowledge sharing processes and enabling conditions

We commented in Subsection 3.2.2 (on page 22) that "Tacit knowledge is the organization's most valuable knowledge because it is considered as the critical source of creativity and innovation (Nonaka and Takeuchi, 1995)." Furthermore, we argued in Subsection 3.2.3 (on page 22) that individual human knowledge is created and expanded through social interaction. As already hinted at in Subsection 1.4.2 (on page 8) in the discussion about the difference between knowledge management and knowledge sharing, social interaction can never be enforced, it can only be facilitated and supported. This implies creating an environment conducive to knowledge sharing in which emphasis is laid on the motivation of people to share their ideas, thoughts, and knowledge and to accept and use the opinions, views, judgments and beliefs of other people. Therefore we may conclude from our descriptive conceptual model that some conditions — those with a motivational nature — are more significant than other conditions — the conditions with an instrumental nature. The conditions with a motivational nature try to influence the attitude of people to share

their tacit knowledge and to accept and use the tacit knowledge of others (in the creating and using knowledge sharing processes of Table 5.1 above). The conditions with an instrumental nature are more orientated on an effective availability of explicit knowledge (in the manipulating and delivering knowledge sharing processes of Table 5.1 above).

5.6 Conclusion

This chapter identified the — in our opinion most relevant — conditions and enablers that facilitate knowledge sharing in an organization. These conditions and enablers were recognized using a combination of the findings from our case studies, i.e. Table 4.1 and Table 4.2 (on page 51 and 62 respectively), and existing literature. The descriptive conceptual model presented in this chapter (which was described in Section 5.5 on page 88) builds on the descriptive empirical model (as described in Chapter 4 on page 41) and comprises social, organizational, and technological conditions and their relation to knowledge sharing processes (as defined in Chapter 3 on page 21).

An issue worth considering is whether these described conditions really enable the knowledge sharing processes within an organization. We observed in Sections 2.1 and 2.2 (on page 11 and 12 respectively) that knowledge sharing is about phenomena that are neither directly observable nor easily discernible (Lee, 1989). For example: it is intricate to determine whether knowledge sharing has actually occurred (because the moment between acquiring and using knowledge may take some time). It also feels questionable to claim that perceived behavioral change results from knowledge sharing, because knowledge is of a "dynamic and continuously evolving nature" (Malhotra, 1997a). Consequently, the possible influence of conditions and enablers on knowledge sharing may not be directly observable:

- their effect on knowledge sharing is to a large extent not measurable as knowledge sharing itself is barely quantifiable;
- evaluation of these facilitators is complex for there does not exist a standard or norm value which to compare to;
- influencing or steering these facilitators is complicated for no applicable theory exists about their feasible stimuli nor about the results or outcomes these stimuli may have on the identified conditions and enablers.

Another issue we have to reflect on is the fact that we do not have a guarantee that we identified all conditions that enable knowledge sharing. We contend that the nature of our research question involves "dynamic nonlinear processes with interactions between multiple units over time [that] complicates any observational research" (Miner and Mezias, 1996). Furthermore, as addressed above, knowledge sharing is about phenomena that are neither directly observable nor easily discernible. Therefore the key concepts of our descriptive conceptual model are derived in a pragmatic, inductive way: it will offer insight into conditions related to knowledge sharing that we consider are the most relevant.

The next chapter addresses the subsequent step of the inductive-hypothetical model cycle: to formulate the theory that will enable us to address our research problem. Our descriptive conceptual model will be the underpinning to study and formulate the prescriptive conceptual model.

6 PHASES OF KNOWLEDGE SHARING IN AN ORGANIZATION

I would rather discover a single fact, even a small one,
than debate the great issues at length without discovering anything at all.
G. Galilei

6.1 Introduction

In this chapter we present our prescriptive conceptual model. This model is the next step in the inductive-hypothetical model cycle and builds on the foundation laid out by our descriptive conceptual model that was formulated in the previous chapter. As stated in Subsection 2.3.2 (on page 13) the prescriptive conceptual model holds the theory to solve the research problem. We defined our research question in Section 2.2 (on page 12) as follows: "Which conditions facilitate the sharing of knowledge between people in an organization." Based on the findings of its preceding chapters, Chapter 5 identified the social, organizational, and technological conditions that — according to our research — facilitate knowledge sharing in an organization.

Our descriptive conceptual model (that was described in Section 5.5 on page 88) clusters these enabling conditions according to their relation to the knowledge sharing processes. Our discussion in Section 5.5 indicates that some conditions are more appropriate to stimulate in a certain situation than others. A condition like for example *knowledge champion* may turn out to be more effective than a condition like for instance *metric* in a situation where an organizational knowledge sharing program has to get started. This observation compels us to detail these situations. We argue that an organization that only recently began facilitating knowledge sharing should focus on other conditions and enablers than an organization that is occupied with knowledge sharing already for a considerable amount of years. Therefore we propose that a refinement can be found related to the development of an organization with respect to knowledge sharing. Such a development can be characterized by several phases. Gephart et al. (1996) observe that when an organization passes through each phase, knowledge sharing "moves from being unintentional, individualistic, and not integrated to being formalized, expanded and connected; until it is a collective, strongly integrated, and daily part of the whole organization."

Another refinement of our descriptive conceptual model comes from considering the knowledge sharing strategy an organization employs (see our elaboration in Section 6.8 on page 101). This means that for the construction of our prescriptive conceptual model we refine our model into two matrices — one for each possible type of strategy — in which the different phases, associated with the development of knowledge sharing in an organization, are incorporated. In these two matrices — i.e., in our prescriptive conceptual model — each phase is related to their most appropriate social, organizational, and technological conditions that enable knowledge sharing.

6.2 The knowledge journey

Gephart et al. (1996) and Kapoor (2002) discuss a developmental model of the learning organization, developed by Woolner, Lowy, and Redding. This model comprises "five

stages through which an organization can, through an evolutionary process, improve its capacity to learn" (Kapoor, 2002):

Stage 1: the forming organization

In this stage "learning is an informal process that takes place as information is used and decisions are made. Much is learned by experience, largely through trial and error" (Kapoor, 2002). There are no (corporate) programs in place to manage learning in the organization.

Stage 2: the developing organization

Kapoor (2002) observes that this stage is entered when an organization "realizes that there are levels of performance possible that are beyond the current capabilities of the members of the enterprise. At that point learning is viewed as a commodity that may be purchased from the world outside the organization. People are sent to seminars, short courses, and conferences with the expectation that they will return to apply their new-found knowledge on the problems of the day." The concept of learning is typically linked to classroom education.

Stage 3: the maturing organization

Kapoor (2002) suggests "organizations generally only move to Stage 3 of the learning process when they realize that there is a need to learn that cuts across the organizational structure and that the economies of scale suggest that programs should be brought inside the organization walls. While at this stage, there is a growing awareness of the need for learning in the organization as a formal human resource development activity, the connection between educational activities and the overall corporate strategy is not strong. In large organizations, Stage 3 may produce a number of disjointed programs that lack the ability to sustain themselves over the long term." In this stage learning is considered a necessity to increase competencies of employees and with that to improve the organizational performance.

Stage 4: the adapting organization

Kapoor (2002) recognized that "organizations can move to Stage 4 of the learning process only when clear linkages can be established between the strategy / direction of the firm and the learning agenda that will be require to support that direction. Internal learning institutes / colleges are often established to address needs at specific functional levels and technological directions. However, there still exists here a basic separation between the formal process of learning and what is happening daily in the workplace. Learning remains an activity outside of work because managers have not as yet seen it as a fundamental responsibility." Learning is addressed in the organizational strategy — (in the future) needed competencies are defined — but is not yet transparently part of the way of thinking and the way of working.

Stage 5: the learning organization

Kapoor (2002) claims "companies can move to Stage 5 only when they begin to recognize that learning must move out of the classroom and into the day-to-day activities of the individual in the work environment." Learning now becomes a responsibility of management and of work teams. Self-managing work teams are an example of the environment in which Stage 5 learning is realized." Learning in this stage enables the organization to adapt to changes in its environment because learning is embedded in the daily routines.

Another model comes from Bair (1997), who describes a knowledge management evolution through three phases:

Phase 1: knowledge retrieval / tacit knowledge uncaptured

Bair (1997) contends "at this stage, knowledge is mostly tacit (in users' heads) and information resources are islands that coexist in the enterprise. These islands rank low on the community and dynamism axes since the content is difficult to share and is in static repositories" and attention must be directed to stimulate knowledge sharing "successful knowledge management will recognize knowledge contributions as an explicit criterion for evaluation of individual performance."

Phase 2: connectivity

In this phase organizations "will shift emphasis from storing and retrieving information to discovering and maintaining relationships among people and their information objects. Information resources will be online, indexed, and mapped. People will be identified by expertise, community, skills, and affiliation. In addition to these interpersonal links, processes to capture tacit knowledge in an explicit knowledge representation will be in place" (Bair, 1997).

Phase 3: the coordinated enterprise

In this phase Bair (1997) claims that "knowledge sharing becomes an underlying component of the organization's culture. Models (both state and process) will be in place to enable communities (linked by process, interests, projects, committees) to collectively act with 'all' the related knowledge residing in the enterprise (relevance). The modeling technologies will capture processes across the enterprise (dynamism), include all knowledge workers (community), and keep track of changing information and relationships. Models describe the relationships among things, particularly the change in one entity due to the change in another." The organization combines all its resources to improve its performance.

Parlby (1999) proposes an alternative model to characterize the development of knowledge sharing within an organization. Parlby defines a 'knowledge system' as the web of processes, behaviors, and tools that enables the organization to develop and apply knowledge to its business processes. Parlby argues that building a knowledge system is like undertaking a journey: "You need a map to plan out your path and the possible alternative routes along the way. You will also need an understanding of the tools you have at your disposal and the resources you may need to reach your final destination and points in between." The knowledge system journey has five distinct stages:

Stage 1: the knowledge-chaotic environment

Parlby (1999) observes that in this stage "the organization is unaware of the importance of knowledge to the achievement of its goals. This stage is characterized by the storage and management of knowledge in an ad hoc manner across the organization. The accessing and retrieval of information is difficult and time-consuming because of the difficulty of identifying sources of knowledge. Systems may be incompatible. Processes for collecting information may be ineffectual or non-existent. People may be reluctant to share information or simply lack the time or incentive to do so."

Stage 2: the knowledge-aware organization

In Stage 2 "the organization is aware of the need to husband its knowledge and some attempt has been made to do so. Knowledge processes and sources within the organization have been identified and documented. The retrieval of information is facilitated by a catalogue of the available knowledge sources and their use within established knowledge processes. However, awareness and implementation across the organization may not be uniform. Ownership and sharing of knowledge may be an issue" (Parlby, 1999).

Stage 3: the knowledge-enabled organization

Parlby (1999) proposes that in this stage "knowledge management is beginning to benefit the business. Standard procedures and tools are utilized across the organization to access information stores. Knowledge resources have been inventoried, evaluated, and classified, and procedures have been implemented to maintain this listing. A number of the cultural and technological barriers have still to be addressed."

Stage 4: the knowledge-managed organization

Parlby (1999) states that "the organization has an integrated framework of procedures and tools to discover, create, maintain, and retrieve information. The technological and cultural issues have been overcome. The organization's knowledge strategy is reviewed and improved on a continuing basis."

Stage 5: the knowledge-centric enterprise

In this stage Parlby (1999) reasons that "the organization's mission is the application and enhancement of its knowledge base, which is providing it with a demonstrable sustainable competitive advantage in its markets. Knowledge management procedures are an integral part of organizational and individual processes. Knowledge management tools are highly integrated and reside on a robust technological backbone that allows knowledge to be mission-critical to the enterprise. The assessment and improvement of the knowledge environment are standard operating procedures. The value of knowledge to the organization is being measured and reported to stakeholders, is reflected in the organization's market value, and is being managed as the organization's intellectual capital."

When we consider these three models, that all denote a development in organizational knowledge sharing, we may contend the initial phase of development indicates an *unawareness* on the advantages of knowledge sharing. Learning and sharing of knowledge takes place in an ad hoc manner. An indication of the development of organizational knowledge sharing amounts to realizing the value of information retrieval to the performance of the organization. Information management is introduced and information and explicit knowledge is being stored in *knowledge repositories* to accommodate easy retrieval. As a kind of intermediate phase (stage 3 of the Woolner model: the maturing organization, phase 2 of Bair's model: connectivity, and stage 3 of the knowledge system journey: the knowledge-enabled organization) pointers to an organization's internal and external information and knowledge sources — both tacit and explicit — are offered: the *knowledge routemap* (as described in Subsection 5.4.2 on page 86). Another suggestion of the development of organizational knowledge sharing may come from considering the ways *collaborative efforts* are supported and related to the organizational strategy. The organization is now focused on communication, coordination, collaboration, participative decision-making, and on learning together. As a kind of ultimate phase in the development of organizational knowledge sharing we may qualify the organization as a *learning organization*. Changes in the organizational environment can be coped with and sometimes may lead to second loop learning. Therefore, based on the three models by Woolner, Bair, and Parlby described above, we define the following knowledge sharing phases:

- the unawareness phase;
- the knowledge repository phase;
- the knowledge routemap phase;
- the collaborative platform phase;
- the organizational learning phase.

Below, the characteristics of each phase are detailed in the same manner we used for analyzing our case studies (see Chapter 4 on page 41): by giving a description and by studying the human, organizational, and technology factors of such a phase.

In an organization the borders between each phase may generally be somewhat blurred, nevertheless we argue this distinction in phases will help to indicate the status quo of an organization with regard to the maturity level in knowledge sharing. Moreover, this distinction may help to identify the most suitable conditions that apply to a certain phase in knowledge sharing.

Because our perspective is to identify conditions and enablers of knowledge sharing, more than the mere development of knowledge sharing itself, we build on Parlby's distinction to accommodate also characteristics of the environment of an organization, the sort of products or services of the organization, the employees present, and the type of issues that confront an organization — in short: the organizational strategy. Hansen et al. (1999) observe that for the best results the knowledge sharing strategy should fit into the overall organizational strategy. Consequently, we argue that the development of an organization with respect to knowledge sharing follows the knowledge management strategy (which follows the organizational strategy), as strategy determines the direction of the way of thinking, the way of working, and the way of controlling. So, the knowledge sharing phases we proposed are related to these two knowledge management strategies.

Hansen et al. (1999) define two distinct knowledge management strategies, that they relate with the "use of information technology to capture and disseminate knowledge":

The codification strategy

This strategy is computer centered: "Knowledge is carefully codified and stored in databases, where it can be accessed and used easily by anyone in the company." We associate this with a knowledge repository (as addressed in Subsection 5.4.1, page 85).

The personalization strategy

The main purpose of a computer in this strategy is to facilitate communication of knowledge between people instead of storing it, because "knowledge is closely tied to the person who developed it and is shared mainly through direct person-to-person contacts." We relate this view to a collaborative platform (as detailed in Subsection 5.4.3 on page 87).

6.3 The unawareness phase

An organization in the unawareness phase does not realize the possible contribution of knowledge to its competitiveness (Parlby, 1999). Knowledge sharing is not addressed in the organizational vision or strategy (Hiebeler, 1996). As a result, no structured or integrated approach is employed to disclose (digitally stored) sources of information or knowledge. If management of information or knowledge takes place, it is done in an ad hoc manner. Learning will predominantly take place at the individual level (Schein, 1995a).

The human factor in the unawareness phase

Employees of an organization in the unawareness phase do generally not have an infrastructure for information or knowledge sharing at their disposal. In their attitude people may show a reluctancy to share information and knowledge and the organization does not issue

incentives to change this behavior (Long, 1997). Long-term human resource policies and individual educational programs do often not exist. There is no staff employed with a specific responsibility for encouraging knowledge sharing.

The organizational factor in the unawareness phase
The organizational structure consists of organizational units who are sole responsible for meeting their own targets (which are not defined on an aggregate level but on the level of the organizational unit only), which is reflected in their — often segmented or even autonomous — way of operation. No budget is allocated for an integrated collection, storing, or dissemination of information and knowledge (Bair, 1997). The balance sheet of the organization does not consider intangible assets (or intellectual capital). The prevalent culture may be characterized by the maxim 'knowledge is power'.

The technology factor in the unawareness phase
There is a lack of accepted standards and procedures for hardware, middleware, software, and content. The information and communication systems are mainly focused on transaction processing and, because of the segmented way of operation of the organizational units, they may be incompatible with each other (Parlby, 1999): they resemble 'islands of automation' and do not support mutual exchange of data, information, or knowledge.

6.4 The knowledge repository phase

The knowledge repository phase is applicable to organizations that have become aware of the potential value of information and (explicit) knowledge. In its strategy the organization pays attention to information management and the management of explicit knowledge. The organization is investing in information systems. Steps have been taken to realize and use an infrastructure that facilitates the creation, structuring, accessing, and usage of information and explicit knowledge (Hiebeler, 1996). The information and the explicit knowledge components are — with the aid of information and communication technology — being held or stored into (usually digital) knowledge repositories. A content classification scheme or taxonomy is used to organize the knowledge repositories to facilitate grouping, indexing, sorting, visualization, searching, publication, manipulation, refinement, and navigation of the stored information and explicit knowledge components (Elliott, 1997a). Not only at the individual level but also at team-level learning may (hesitantly) occur.

The human factor in the knowledge repository phase
Management of the organization starts to recognize the value of information and knowledge (Parlby, 1999), which will eventually result in an online environment to support information exchange, storage, and retrieval in a structured way (Bair, 1997). This helps employees in finding needed information faster and easier, which in turn may positively influence their attitude and behavior towards contributing information and explicit knowledge components themselves. The organization has defined a human resource policy that may include individual development (and training) programs (Powell and Dent-Micallef, 1997). Normally an Information Manager is appointed in or very near to topmanagement who holds specific responsibility for the information flows and for the information systems of the organization.

The organizational factor in the knowledge repository phase

The boundaries between the organizational units weaken. Work is increasingly being done in teams and targets are set on a wider organizational scale. This generates attention for and interest in the environment outside people's own organizational unit and for events outside the organization (Nevis et al., 1995). There is a growing need to record experiences in order to make use of this (by oneself or by others) in a similar situation in the future (Mohrman and Finegold, 2000). The organization becomes better equipped for the processing of information (like text, image, and graphics) and explicit knowledge components (like descriptions of best practices, information from business applications, lessons learned, manuals, reports and articles, or customer related databases).

The technology factor in the knowledge repository phase

In this phase more and more technology standards, architectures, and procedures are accepted at an organization wide scale. A growing integration shapes the way of working which stimulates the coupling of information systems. Electronic networks offer (online) connections between systems and between people. Information and communication technology tools provide the functionality to have information and explicit knowledge components online accessible (Anderson and Smith, 1998). As described in Appendix C (on page 215) several tools offer this functionality. These tools may capture and store information and explicit knowledge into online knowledge repositories that may be seen as electronic (digital) libraries. They will also facilitate access to, manipulation, and distribution of the content of these repositories. Other information and communication technology tools provide the functionality for people to electronically communicate with each other (Malhotra, 1997).

6.5 The knowledge routemap phase

An organization in the knowledge routemap phase realizes the benefits of knowledge and undertakes increasing effort in making — sources of — knowledge available. The knowledge sharing strategy focuses not only on sharing of explicit knowledge but also on sharing of 'indirect' knowledge by means of knowledge routemaps (Bair, 1997). Knowledge routemaps are online guides, directories, or pointers to an organization's internal and external information and knowledge sources — both tacit and explicit. Knowledge routemaps provide pointers to identified sources of knowledge that can include people with a special expertise, knowledge intensive processes, or may offer links to documents that describe research results, diagnostics or benchmarking tools, or list frequently asked questions (Anderson and Smith, 1998). Knowledge routemaps also may offer online learning.

In this knowledge routemap phase knowledge components are continually been identified, inventoried, evaluated, classified, maintained, and refined. Standard procedures and tools for access to these online knowledge components are available to every employee of the organization, irrespective of time and place (Parlby, 1999). An organization in this phase is aware that the quality, accuracy, and completeness of these knowledge components are vital for satisfying the information needs of their employees. Such an organization also realizes that cooperation of their employees in creating, using, maintaining, and refining these knowledge components is paramount to overall success. Therefore organizations start to stimulate and motivate people to access and create knowledge components, to contribute to discussion groups, to help colleagues, to share their ideas and thoughts, and to join

communities of practice (Bair, 1997; Denning, 1998). Learning takes place at the individual-, at the team-, and sometimes at the organizational unit level. Not all social, organizational, and technological issues related to knowledge sharing are resolved yet.

The human factor in the knowledge routemap phase
Time and money is structurally invested in people for their individual development. More emphasis is put on working in teams across organizational boundaries and forms of collaboration emerge. Formal appraisal systems for development, sharing, and usage of knowledge are being put into place (Bair, 1997). Openness, curiosity, ingenuity, resourcefulness, and creativity of people is appreciated and valued. Some staff is appointed to search for new knowledge components and to encourage knowledge sharing in general.

The organizational factor in the knowledge routemap phase
In the organizational strategy certain attention is given to the management of knowledge. The norms, values, and practices of the organization slowly turn towards openness, sharing of ideas and thoughts, importance and well-being of its employees, and the need for continuous innovation (Nevis et al., 1995). Management supports, sponsors, and commits it selves to knowledge sharing initiatives, programs, and projects. The organizational structure looses its hierarchical grouping and becomes more networked. Business processes across the organization are reengineered from a perspective of knowledge creation and usage (Harris, 1999).

The technology factor in the knowledge routemap phase
In the knowledge routemap phase standardized and often interlinked systems and tools from information and communication technology are deployed to electronically exchange information, to connect people with other people, to facilitate teamwork, to enable the sharing of ideas, and to assist in the use of best practices to guide future behavior (Tenkasi and Boland, 1996). Knowledge routemaps can be realized by several tools that are described in Appendix C (on page 215).

6.6 The collaborative platform phase

Organizations in the collaborative platform phase use knowledge to compete and to address their business drivers. The way of working is focused on participative decision-making, collaboration, and learning together (Schein, 1995), for instance in communities of practice. An integrated framework of procedures and tools exists to support the collective creation and usage of solutions and knowledge (Malhotra, 1993). The organization's knowledge sharing strategy is focused on tacit knowledge and is evaluated and refined on a continuing basis. Single loop learning takes place at the individual-, team-, organizational unit-, and occasionally at the organizational level. Social, organizational, and technological barriers to knowledge sharing have largely been overcome.

Knowledge sharing occurs when people are connected with other people and when collaboration and sharing of thoughts between people is stimulated. Collaborative platform functionality is offered by information and communication technology to facilitate group or teamwork and collaboration in a distributed virtual environment (Hiebeler, 1996). Collaborative platforms may encourage debate, dialogue, interaction, creativity, innovation, and sharing (Duffy, 1996) that otherwise would have been constrained by barriers of time and place.

The human factor in the collaborative platform phase

People are at the center of things in the organization that finds itself in the collaborative platform phase. People are motivated and involved to be engaged in collaborating with other people (Gephart et al., 1996). The necessary conditions to make this possible (like appreciation and infrastructure) are more or less fulfilled. A member of topmanagement enthusiastically functions as a knowledge champion (Schein, 1995a). Job rotation occurs frequently. Some employees — at all levels of the organization — are specifically assigned with responsibilities for knowledge sharing, for example as a Competency Knowledge Manager or as the Chief Knowledge Officer.

The organizational factor in the collaborative platform phase

The vision and strategy of an organization in this phase concentrates on knowledge sharing, as management perceives this will add value externally and internally (Bair, 1997). This leads to an expanding interest (in time and money) in related issues, projects, programs, and policies. The organization is typified by its flat hierarchical, networked (perhaps organic) structure with a focus on solving problems by groups (Long, 1997). These groups enjoy a high degree of autonomy and empowerment, which is supported by an infrastructure that supplies these groups with the data, information, and knowledge needed in order to make their decisions (Wilson, 1996). The way of working is determined by flexible procedures that incorporate knowledge sharing and takes place in small — often constructed for a limited time — interconnected organizational units. The culture of an organization in the collaborative platform phase will "value diversity in perspectives, tolerate ambiguity, value innovation, and accept risk taking" (Glynn, 1996). Efforts are made to value the intellectual capital on the balance sheet.

The technology factor in the collaborative platform phase

In Section 3.7 (on page 37) we addressed the way in which information and communication technology can support communication, collaboration, and knowledge sharing *anytime anyplace*. In such an environment people are electronically connected with other people and collaboration is facilitated and stimulated (Harris, 1999). We described a collaborative platform in Subsection 5.4.3 (on page 87) as an online environment that offers support for (Duffy, 1996): communication and multimedia interconnectivity between people, sharing and collaboration between people, and for organizational coordination. It facilitates shared creation and capturing of tacit knowledge in for instance teams, communities of practice, interest groups, or competency centers. Collaborative platforms can be realized through several tools, as described in Appendix C (on page 215).

6.7 The organizational learning phase

The organizational learning phase can be portrayed using our concept of the organization as described in Section 1.3 (on page 4): living systems who are dependent on the environment in which they live. McGee and Prusak (1996) explain that for an organization, learning is the process of adapting to one's environment, just like all other living organisms. Senge (1992) emphasizes that although a learning organization continuously improves its ability to adapt, learning in order to survive and grow is not enough. An organization should also enforce generative learning, in line with its strategy, to enlarge its ability to create its future. Generative learning or double loop learning "requires the learner to reframe, to develop new concepts and points of view, to cognitively re-define old categories and to change standards of judgment" (Schein, 1996). This type of learning requires the

modification of the organizational values and norms and increases the learner's capacity to deal with situations in new ways and creates the possibility for developing new skills (Senge, 1990). Continuous experimentation and feedback are emphasized to acquire new ways of looking at the organizational environment.

According to Garvin, Gephart et al., and Choo (1993, 1996, and 1998 respectively), a learning organization can be characterized as follows:

Adaptation to a changing environment
The organization monitors its environment and is able to adapt itself in a timely and effective manner to changes in the environment.

Systematic problem solving
The organization applies known and accepted (quantitative) methods and techniques, rather than guesswork, for diagnosing problems; thereby using organized data, rather than assumptions, to draw inferences.

Experimentation with new approaches
The organization is methodically searching for and practicing new, state-of-the-art knowledge and is willing and keen to try new technologies and alternative ways of working. It thereby promotes inquiry, dialogue, risk taking, and experimentation.

Learning from own experiences and past history
It is practice in the organization to review and evaluate its successes and failures, to assess them systematically, to openly communicate the lessons learned, and to store these lessons in a widely accessible form. The organization is able to engage in, support, and reward continuous organizational learning, including the unlearning of assumptions, norms, and mind-sets that are no longer valid

Learning from experiences and best practices from others
The organization is able to learn from the insights of other companies and the know-how from external experts.

Transferring knowledge over the organization quickly
Knowledge is spread swiftly and efficiently throughout the organization, as a result of which insights are shared company-wide. The knowledge and expertise of its members is mobilized to induce innovation and creativity.

The human factor in the organizational learning phase

A prerequisite for knowledge sharing in the organizational learning phase is that people should participate unconditional, as is underlined by our arguments in Subsection 3.2.4 (on page 25): knowledge creation and sharing is a continuous and dynamic process involving interactions at various organizational levels. Organizational learning builds on knowledge creation and sharing by individuals. Learning at team, group, or organizational level "should be understood as a process that 'organizationally' amplifies the knowledge created by individuals and crystallizes it as a part of the knowledge network of the organization" (Nonaka and Takeuchi, 1995). Tenkasi and Boland (1996) observe that "The overall organizational knowledge base emerges out of the process of exchange, evaluation, and integration of knowledge. Like any other organizational process, it is comprised of the interactions of individuals and not their isolated behavior."

The organizational factor in the organizational learning phase

The mission, vision, and strategy of the organization emphasize the importance of knowledge and — double loop — learning for its survival and its competitive advantages (Choo, 1995). Knowledge sharing is an integral part of the business functions, processes, and activities (Parlby, 1999) that are organized into networked, organic structures. It is sup-

ported by a highly integrated infrastructure that focuses on data, information, and knowledge — explicit as well as tacit — and which comes from both internal (i.e. from within the organization) and external sources (i.e. from customers, partners, markets, and competitors).

Every experience is seen as an opportunity to improve and to learn. Gephart et al. (1996) express their view that "A learning organization is an organization that has an enhanced capacity to learn, adapt, and change. It's an organization in which learning processes are analyzed, monitored, developed, managed, and aligned with improvement and innovation goals. Its vision, strategy, leaders, values, structures, systems, processes, and practices all work to foster people's learning and development and to accelerate systems learning." The organization measures the perceived value of its knowledge, which is incorporated into the balance sheet (Parlby, 1999).

The technology factor in the organizational learning phase

The information and communication technology plays a major supportive role and provides an organization-wide interconnected environment that operates in a constant interaction with its surroundings. Emphasis is put on precognition and adaptation (Malhotra, 1997).

6.8 Codification strategy and personalization strategy

Another refinement of our theory comes from considering the strategy to realize knowledge sharing. Hansen et al. (1999) observe: "A company's choice of strategy is far from arbitrary — it depends on the way the company serves its clients, the economics of its business, and the people it hires." As described in Subsection 3.6.1 (on page 34) the knowledge sharing strategy ought to be guided by the characteristics of the products or services of the organization (Hansen et al., 1999). We mentioned in Section 6.2 (on page 91) two distinct knowledge management strategies that Hansen et al. (1999) defined: the codification strategy and the personalization strategy (see Table 6.1 below).

	Codification strategy	Personalization strategy
People	Reward people for using and contributing to document databases	Reward people for directly sharing knowledge with others
Organization	Provide high-quality, and reliable products and services by reusing codified knowledge: invest once in a knowledge asset; reuse it many times. *People-to-documents:* develop an electronic document system that codifies, stores, disseminates, and allows reuse of knowledge	Provide creative solutions by combining individual expertise: offer access to experts to create highly customized solutions to unique problems. *Person-to-person:* develop networks for linking people so that tacit knowledge can be shared
Technology	Invest heavily in information and communication technology: the goal is to connect people with reusable codified knowledge	Invest moderately in information and communication technology: the goal is to facilitate conversations and the exchange of tacit knowledge

Table 6.1: Characteristics of codification and personalization strategy (Hansen et al., 1999)

If the products or services and the issues or problems are standard, mature, or relatively clear and do not vary much, we call this a relatively slow changing environment and the strategy should focus on elaborate storage and easy access of explicit knowledge (the strategy focuses on reuse of knowledge), i.e. this is the codification strategy.

If however an organization sells customized, unique, or innovative products and services, or has to solve intricate problems that are one of a kind, knowledge about those products, services, or issues doesn't have a high re-usage value or becomes out of date quickly. An organization in such an environment should consider offering easy access to specialists and experts because people need to share information that would get lost if it had been codified: this we define as the personalization strategy (which focuses on leverage of tacit knowledge).

As stated in Section 6.2 (on page 91) the development of an organization with respect to knowledge sharing (i.e. its knowledge sharing phases) should follow the knowledge management strategy. An organization with a codification strategy puts emphasis on reusing explicit knowledge and therefore may enter the knowledge repository phase before an organization with a personalization strategy. This latter type of organization is focused on linking people to share tacit knowledge. This may result in arriving at the collaborative platform phase before an organization that carries a codification strategy. The difference in the sequence of the knowledge sharing phases for the two types of strategy is depicted in Figure 6.1 on page 102).

6.9 Knowledge sharing phases and enabling conditions

We refined our descriptive conceptual model (as described in Section 5.5 on page 88) by introducing phases that characterize the development of knowledge sharing in an organization. Another refinement came from incorporating the knowledge sharing strategy. These refinements enable us to construct our prescriptive conceptual model as two matrices — one for the codification strategy and the other for the personalization strategy — in which each of the knowledge sharing phases is associated with their most appropriate social, organizational, and technological conditions that enable knowledge sharing.

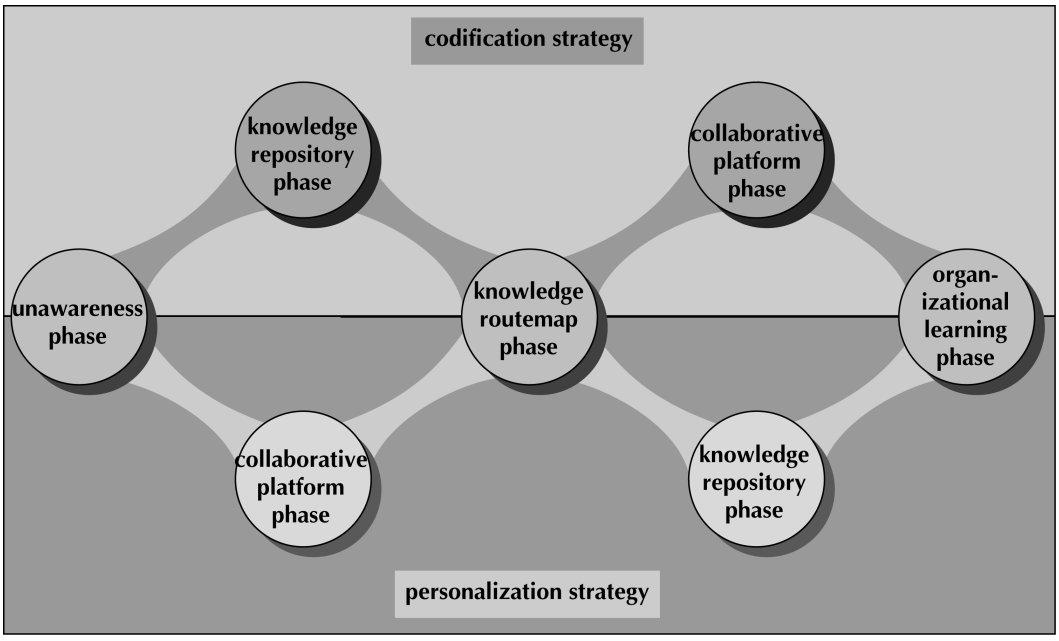


Figure 6.1: Knowledge sharing phases under a codification or personalization strategy

We first relate — in Table 6.2 below — the knowledge sharing phases to the knowledge sharing processes (as explained in Section 3.3 on page 26). These relations follow straightforward from their associations with explicit, tacit, or combined types of knowledge.

	Knowledge sharing processes
Unawareness phase	• none
Knowledge repository phase	• creating knowledge / explicit-to-explicit, and explicit-to-tacit • valuation of new explicit knowledge • organizing & classifying assessed explicit knowledge • storing structured explicit knowledge • maintaining and refining stored explicit knowledge • distributing stored explicit knowledge • accessing stored explicit knowledge • using explicit knowledge
Knowledge routemap phase	• creating knowledge / tacit-to-tacit, tacit-to-explicit, explicit-to-explicit, and explicit-to-tacit • distributing stored explicit knowledge • accessing stored explicit knowledge • using explicit and tacit knowledge
Collaborative platform phase	• creating knowledge / tacit-to-tacit, tacit-to-explicit • using tacit knowledge
Organizational learning phase	• all

Table 6.2: Knowledge sharing phases and knowledge sharing processes

In our descriptive conceptual model (see Table 5.1 on page 89) we related the knowledge sharing processes to the 19 social, organizational, and technological conditions we identified in Chapter 5 (on page 65). When we combine this Table 5.1 with Table 6.2 (as given above) we get a first association between the knowledge sharing phases and the enabling conditions. Because each knowledge sharing phase is related to processes involved with both creating and using knowledge (and these processes combined are influenced by each condition), this results in an association in which all conditions are related to all phases. Such an association is in contrast with our belief that an organization that only just started with knowledge sharing should focus on other conditions than an organization that is practicing this already for quite some years. Some conditions, like for example a knowledge crew, help to initiate knowledge sharing projects (because they have a specific responsibility in encouraging knowledge sharing) while other conditions, such as competence leverage, help to keep things going in knowledge sharing programs (for this may encourage in people a crave for continuous learning).

Therefore we define the relations between knowledge sharing phases and their most appropriate enabling conditions based on arguments as listed in Table 6.3 below. For both knowledge sharing strategies we present each phase and we describe the conditions related to that specific phase. Within each matrix-cell we list its conditions in a sequence that we identify as an indication of the influence of such a condition on knowledge sharing when compared to the other conditions in the matrix-cell. In the matrix we provide a justification for the positioning of each condition.

CODIFICATION STRATEGY			
	People	**Organization**	**Technology**
All identified conditions (see also Figure 5.1 on page 66)	*appraisal, care, competence leverage, empowerment, knowledge crew, and trust*	*climate of openness, collaboration, community, dialogue, knowledge champion, learning organization, metric, organically structured organization, slack, and system integrated into daily workprocess*	*collaborative platform, knowledge repository, and knowledge routemap*
Unawareness phase	• **none**: as the organization is not aware of a possible contribution of knowledge to its goals, no specific action is taken to stimulate any conditions		
Knowledge repository phase	• **appraisal**: to steer the behavior of people in a direction desired by the organization; appraisal is an essential condition to change the mindset of people from 'information is power' to 'sharing of knowledge is strength' and is therefore the first condition to be stimulated • **competence leverage**: to increase the ability of an employee to accomplish his or her tasks in a changing environment; this condition encourages a positive attitude towards learning and therefore stimulation should be one of the first steps in facilitating knowledge sharing	• **slack**: to allow employees to use time for experimenting with new processes and systems, for reflectivity, and for entering into dialogues with other people; when there is no slack the majority of knowledge sharing programs will fail due to a lack of time to adapt to a new way of working, therefore slack is an essential condition in the initial phase of knowledge sharing • **system integrated into daily workprocess**: to transparently support the usage and capture of explicit knowledge; when people experience tangible advantages in their way of working because applications transparently support the use of knowledge, this may generate a positive attitude towards knowledge sharing, therefore this condition should be stimulated in an early stage of a knowledge sharing program	• **knowledge repository**: to store the information and explicit knowledge; this functionality helps to exploit the potential value of information and explicit information and should therefore be stimulated as one of the first steps in facilitating knowledge sharing in a codification strategy
Knowledge routemap phase	• **knowledge crew**: to assign specific responsibility to some employees for encouraging and im-	• **knowledge champion**: to stimulate knowledge sharing through a convinced commitment of a top man-	• **knowledge routemap**: to provide pointers to sources of knowledge; the logical next step in functionality

CODIFICATION STRATEGY			
	People	**Organization**	**Technology**
	proving the sharing of knowledge within the organization; the presence of a knowledge crew in an organization signals a statement from management that they take knowledge sharing serious and therefore this condition should be stimulated when the organization is somewhat under way with its knowledge sharing efforts	ager to knowledge sharing and therewith related actions; a knowledge champion is capable of breaking down all sorts of organizational obstacles to knowledge sharing and therefore stimulation of this condition is at its place after the first steps of a knowledge sharing program have been taken: then the momentum is there • **metric**: to measure effectiveness of actions undertaken; measuring and assessment of progress in knowledge sharing enables management to steer their efforts, therefore stimulation of metric seems appropriate when the influence of knowledge sharing on the way of working is growing	after information and explicit knowledge was made accessible is to create access to the *sources* of this information and knowledge, therefore we argue that in this phase of knowledge sharing it is proper to stimulate this condition
Collaborative platform phase	• **trust**: to stimulate the cooperative behavior needed in teamwork; as this phase is about social interaction and trust lays the essential fundament for this interaction it follows that this condition is the most important condition to stimulate in this phase • **care**: to encourage genuine relationships between people so they could be more receptive to the ideas and thoughts of other people; by building on trust, people can care for each other, which may inspire a free flow of thought and the acceptance	• **climate of openness**: to encourage a free and uninhibited exchange of opinions, ideas, thoughts, information, and knowledge; such a climate enables the way of working in this phase, i.e. with a focus on participative decision-making, collaboration, and learning together, and therefore it seems justified to stimulate a climate of openness as the first organizational condition in this phase • **dialogue**: to create shared context in which people can understand each other's mental mod-	• **collaborative platform**: to offer people the opportunity to electronically interact and to exchange ideas, views thoughts, and beliefs with each other; functionalities exist that facilitate environments in which people are connected with other people and that support collaboration irrespective of time and location constraints, this warrants stimulation of this condition in this collaborative platform phase

CODIFICATION STRATEGY			
	People	**Organization**	**Technology**
	of other people's ideas, therefore we argue that stimulation of this condition should take place in the collaborative platform phase • **empowerment**: to emphasize individual responsibility for reactions in response to new situations; this condition requires a free flow of information and knowledge between people that stimulates social interaction, therefore we argue it is proper to realize the condition empowerment in this phase	els and view of the world; we argue that in a climate of openness dialogue facilitates knowledge sharing in this phase for it enables people to comprehend the perspective of someone else • **community**: to bring together people to discuss, review and debate shared problems and to connect people with shared interests so they can cross-fertilize their personal experiences, solutions to problems, information, and knowledge; we view community as a structure where people have an inspired social interaction and therefore should be stimulated at a moment when the value of knowledge sharing is clear to the organization • **collaboration**: to help people develop their relationships with each other: working closely together may develop relationships that are based on trust and the drive to help each other which may lead to openness towards the other persons and the acceptance of their ideas, views, and thoughts; as collaboration is the main theme of this phase we reason that it is vindicated to stimulate this condition in this collaborative platform phase	
Organizational learning phase		• **organically structured organization**: to encourage innovation	

CODIFICATION STRATEGY			
	People	**Organization**	**Technology**
		and generate new insights within small autonomous teams to cope with changes in the environment; this structure supports the sharing of knowledge between people, teams, and organizational units in order to be able to adapt to the environment, therefore we consider stimulation of this condition in this phase as valid • **learning organization**: to gain knowledge and develop skills at the organizational level to improve future organizational performance; this 'ultimate' phase in knowledge sharing encompasses all knowledge sharing processes and all enabling conditions, stimulation of this particular condition may lead to incorporation of these processes and conditions in the organizational strategy and in the way of working	

PERSONALIZATION STRATEGY			
	People	**Organization**	**Technology**
All identified conditions (see also Figure 5.1 on page 66)	*appraisal, care, competence leverage, empowerment, knowledge crew, and trust*	*climate of openness, collaboration, community, dialogue, knowledge champion, learning organization, metric, organically structured organization, slack, and system integrated into daily workprocess*	*collaborative platform, knowledge repository, and knowledge routemap*
Unawareness phase	• **none**: as the organization is not aware of a possible contribution of knowledge to its goals, no specific action is taken to stimulate any conditions		
Collaborative platform phase	• **trust**: to stimulate the cooperative behavior needed in teamwork; as this phase is about social interaction and	• **climate of openness**: to encourage a free and uninhibited exchange of opinions, ideas, thoughts, in-	• **collaborative platform**: to offer people the opportunity to electronically interact and to exchange

PERSONALIZATION STRATEGY			
	trust lays the essential fundament for this interaction it follows that this condition is the most important condition to stimulate in this initial phase • **care**: to encourage genuine relationships between people so they could be more receptive to the ideas and thoughts of other people; by building on trust, people can care for each other, which may inspire a free flow of thought and the acceptance of other people's ideas, therefore we argue that stimulation of this condition should take place in an early phase of a knowledge sharing program • **appraisal**: to steer the behavior of people in a direction desired by the organization; appraisal is an essential condition to change the mindset of people from 'information is power' to 'sharing of knowledge is strength' and is therefore one of the first conditions that needs to be stimulated • **competence leverage**: to increase the ability of an employee to accomplish his or her tasks in a changing environment; this condition encourages a positive attitude towards learning and therefore stimulation should be early when facilitating knowledge sharing • **empowerment**: to emphasize individual	formation, and knowledge; such a climate enables the way of working in this phase, i.e. with a focus on participative decision-making, collaboration, and learning together, and therefore it seems justified to stimulate a climate of openness as the first organizational condition in this phase • **slack**: to allow employees to use time for experimenting with new processes and systems, for reflectivity, and for entering into dialogues with other people; when there is no slack the majority of knowledge sharing programs will fail due to a lack of time to adapt to a new way of working, therefore slack is an essential condition in the initial phase of knowledge sharing • **dialogue**: to create shared context in which people can understand each other's mental models and view of the world; we argue that in a climate of openness dialogue facilitates knowledge sharing in this phase for it enables people to comprehend the perspective of someone else • **community**: to bring together people to discuss, review and debate shared problems and to connect people with shared interests so they can cross-fertilize their personal experi-	ideas, views thoughts, and beliefs with each other; functionalities exist that facilitate environments in which people are connected with other people and that support collaboration irrespective of time and location constraints, this warrants stimulation of this condition in this collaborative platform phase

PERSONALIZATION STRATEGY			
	responsibility for reactions in response to new situations; this condition requires a free flow of information and knowledge between people that stimulates social interaction, therefore we argue it is proper to realize the condition empowerment in this phase	ences, solutions to problems, information, and knowledge; we view community as a structure where people have an inspired social interaction and therefore should be stimulated when the focus of knowledge sharing is on exchanging tacit knowledge • **knowledge champion**: to stimulate knowledge sharing through a convinced commitment of a top manager to knowledge sharing and therewith related actions; a knowledge champion is capable of breaking down all sorts of organizational obstacles to knowledge sharing and therefore stimulation is at its place when the first difficult steps of a knowledge sharing program have been taken: then the momentum is there • **collaboration**: to help people develop their relationships with each other: working closely together may develop relationships that are based on trust and the drive to help each other which may lead to openness towards the other persons and the acceptance of their ideas, views, and thoughts; as collaboration is the main theme of this phase we reason that it is vindicated to stimulate this condition in this phase	
Knowledge routemap phase	• **knowledge crew**: to assign specific re-	• **metric**: to measure effectiveness of ac-	• **knowledge routemap**: to provide pointers to

PERSONALIZATION STRATEGY			
	sponsibility to some employees for encouraging and improving the sharing of knowledge within the organization; the presence of a knowledge crew in an organization signals a statement from management that they take knowledge sharing serious and therefore this condition should be stimulated when the organization is fairly under way with its knowledge sharing efforts	tions undertaken; measuring and assessment of progress in knowledge sharing enables management to steer their efforts, therefore stimulation of metric seems appropriate when the influence of knowledge sharing on the way of working is evident	sources of knowledge; the logical next step in functionality after technology enabled exchanging of tacit knowledge is to create access to the *sources* of information and knowledge, therefore we argue that in this phase of knowledge sharing it is proper to stimulate this condition
Knowledge repository phase		• **system integrated into daily workprocess**: to transparently support the usage and capture of explicit knowledge; this condition should be stimulated in this phase as it provides for applications that transparently support people in using knowledge to improve their way of working	• **knowledge repository**: to store the information and explicit knowledge; this functionality helps to exploit the potential value of information and explicit information and should therefore be stimulated in this phase of an organization under a personalization strategy
Organizational learning phase		• **organically structured organization**: to encourage innovation and generate new insights within small autonomous teams to cope with changes in the environment; this structure supports the sharing of knowledge between people, teams, and organizational units in order to be able to adapt to the environment, therefore we consider stimulation of this condition in this phase as valid • **learning organization**: to gain knowledge and develop skills at the organizational level to improve future	

PERSONALIZATION STRATEGY			
		organizational performance; this 'ultimate' phase in knowledge sharing encompasses all knowledge sharing processes and all enabling conditions, stimulation of this particular condition may lead to incorporation of these processes and conditions in the organizational strategy and in the way of working	

Table 6.3: Knowledge sharing phases and enabling conditions

Table 6.3 forms our prescriptive conceptual model. It shows (see also Figure 6.2 on page 112) that numerous conditions are related to the collaborative platform phase: for a personalization strategy 12 conditions out of a total of 19 and for a codification strategy 8 out of 19 conditions. As the collaborative platform phase is the initial phase for an organization under a personalization strategy, it follows that an intensive effort is required to effectively initiate and carry on with a knowledge sharing program within such an organization. When we also consider the nature of these 12 conditions, we see that a majority of these conditions is related to cultural aspects of an organization, and changing the culture of an organization is a slow, uncertain, and cumbersome process (Weggeman, 1997).

In addition to this, Nonaka and Takeuchi (1995) recognize that "Western organizations tend to emphasize explicit knowledge." Perhaps therefore we observe that in real life many organizations follow a knowledge sharing strategy that focuses on explicit knowledge (i.e. the codification strategy), irrespective of whether this suits the characteristics of their products or services, and that this often amounts to realizing a technological instrument such as an intranet (that functions as a knowledge repository). Consequently some organizations may find themselves in the possession of a very sophisticated knowledge system, although one that may seldom be used by their employees. Malhotra (2000) observes: "Often, it is assumed that compilation of data in a central repository would somehow ensure that everyone who has access to that repository is capable and willing to use the information stored therein. Past research on this issue has shown that despite the availability of comprehensive reports and databases, most executives make decisions based on their interactions with others who they think are knowledgeable about the issues."

6.10 Conclusion

In this chapter we presented our next step in our inductive-hypothetical model cycle: the prescriptive conceptual model. This model is a refinement of our descriptive conceptual model in which we identified and clustered social, organizational, and technological conditions that we regard as enablers of knowledge sharing. We introduced different phases of knowledge sharing that an organization may go through. We also incorporated the

codification or personalization strategy an organization may employ for knowledge sharing. This resulted in a prescriptive conceptual model that consists of two matrices — one for each type of strategy — in which the different phases, associated with the development of knowledge sharing in an organization, are related to their most appropriate social, organizational, and technological conditions that enable knowledge sharing.

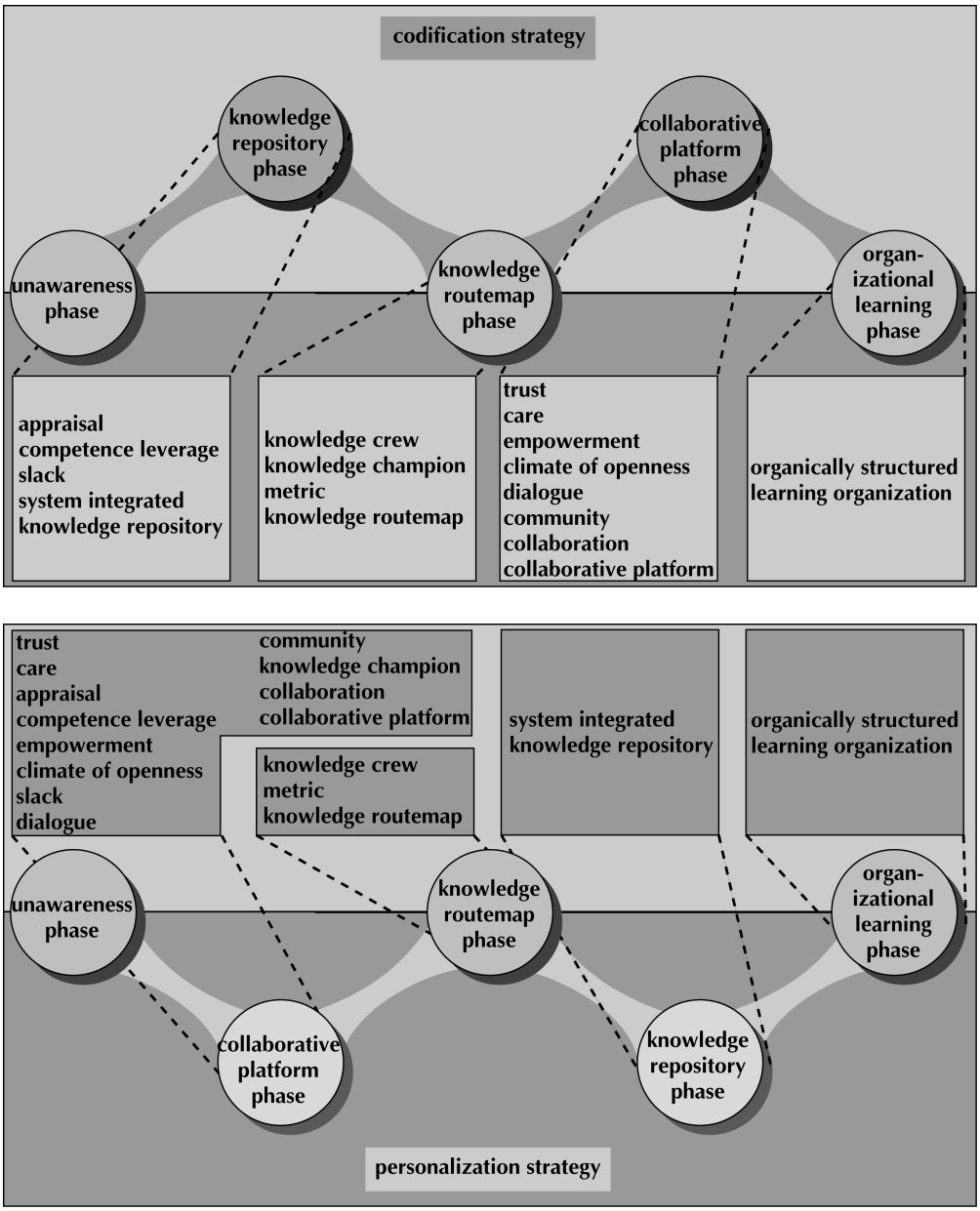


Figure 6.2: Knowledge sharing phases and conditions under both strategies

Our model may enable us to determine which conditions are most suitable to stimulate in an organization, dependent on the characteristics of its products or services, its employees, its environment, and dependent on its particular stage of development with respect to knowledge sharing. This implies that our prescriptive conceptual model may help us to solve our research question "Which conditions facilitate the sharing of knowledge between people in an organization" (as stated in Section 2.2 on page 12). The next step of the inductive-hypothetical model cycle — the implementation of our theory using our prescriptive conceptual model — is the subject of the following chapter.

7 TESTING CONDITIONS FOR KNOWLEDGE SHARING

Better to light a candle
than to complain about darkness.
Chinese proverb

7.1 Introduction

In this chapter we introduce a process to implement our prescriptive conceptual model. The main elements of our theory are enabling conditions, knowledge sharing strategy, and knowledge sharing phases. In Figure 7.1 below we depict these elements and how they may influence each other.

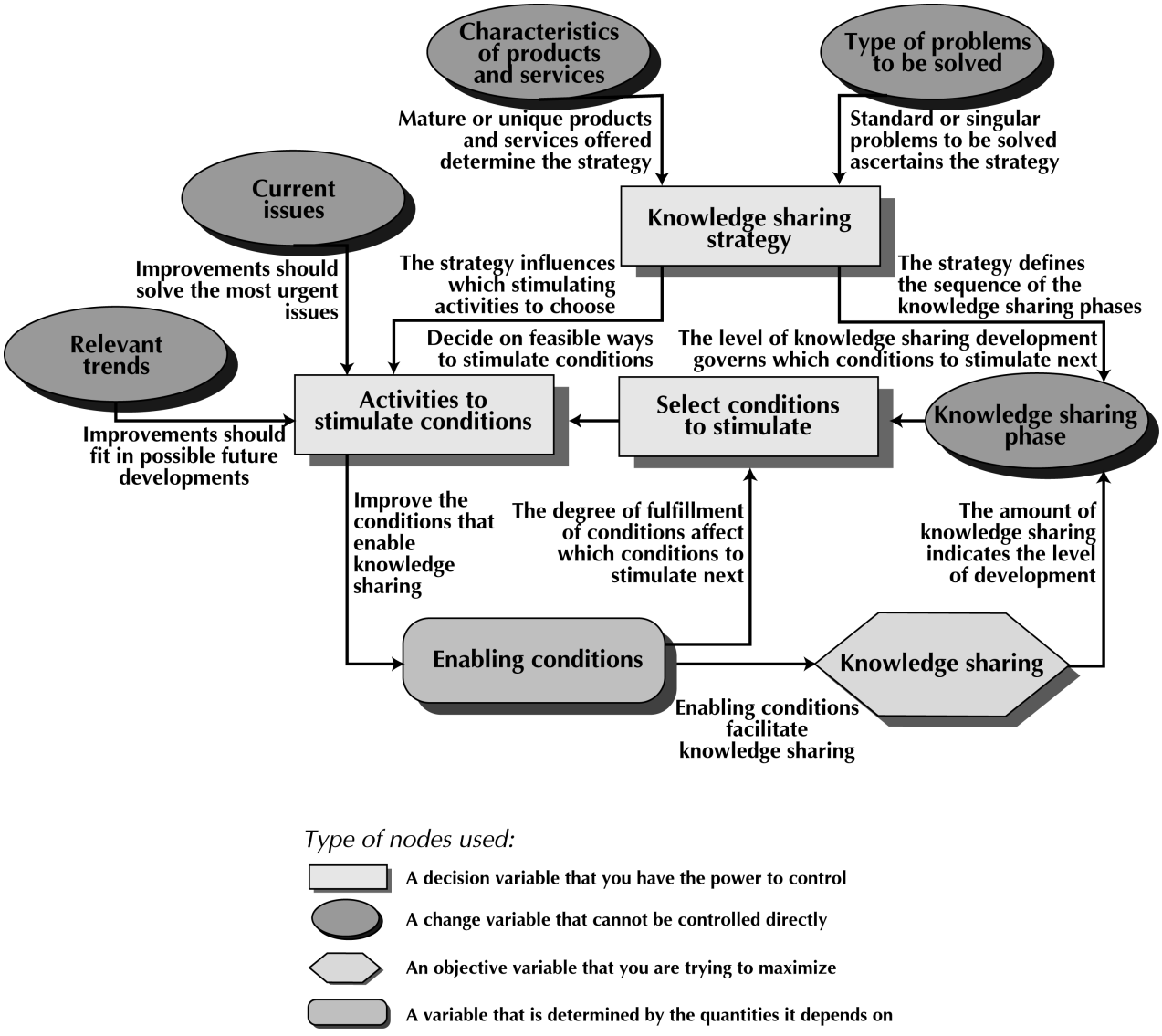


Figure 7.1: Influence diagram on main elements of model for testing conditions

We want to test whether the conditions — as identified and presented in this research — indeed facilitate knowledge sharing in an organization. For that reason we propose to assess the degree of fulfillment of the enabling conditions, undertake appropriate activities

to improve these conditions, and evaluate whether the level of knowledge sharing has changed. Because we consider this process of a repeating nature and, as Gephart et al. (1996) recognize "Becoming a learning organization is a journey not a destination; learning is a never-ending journey, just as change and competition never cease", we introduce a repeating process of assessment and action. This repeating process of assessment and action enables us to address the purpose of this chapter: to be able to implement our prescriptive conceptual model. We describe action as the stimulation of appropriate enabling conditions. By assessing conditions that enable knowledge sharing in an organization, before and some time after a condition is stimulated, a change in the degree of knowledge sharing may become visible. This variation may become an indicator of the effectiveness of (one or more) conditions in facilitating knowledge sharing and can help to test our theory. It may also help organizations in steering their knowledge sharing efforts.

Our repeating process of assessment and action (as shown in the lower half of Figure 7.1 on page 113) is described in the sections below. It is based on a pragmatic assessment of the enabling conditions that — according to our research — facilitate knowledge sharing. This enables us to derive an indication of the level of knowledge sharing in an organization. Given the type of knowledge sharing strategy deployed, this level of knowledge sharing allows us to determine, for the organization at hand, the applicable knowledge sharing phase. Based on this identified knowledge sharing phase and the degree of fulfillment of its related conditions we decide whether to enhance the current knowledge sharing phase or to facilitate a transition from the present into the next knowledge sharing phase. Related to each phase are conditions that are the most appropriate to stimulate (see Table 6.3 on page 111). When we correlate current issues or problems of this organization with possible, relevant trends we can determine the most viable way to realize these stimulations. The effect of these stimulations on the enabling conditions can subsequently be assessed and can give rise to further action.

We comment that without any abstraction or modeling, reality is hard to assess: organizations are of a highly complex nature, the interactions between people are characterized by phenomena that are neither directly observable nor easily discernible, and it is intricate to determine whether behavioral change (of people or of organizations) can be attributed to knowledge sharing. We are aware that the possible influence of conditions on knowledge sharing may not always be clearly demonstrable. However, the primary objective of this dissertation is to understand and gain insight into conditions related to knowledge sharing in an organization. Assessment as defined in this chapter should always be seen from this perspective and should be regarded as a general, applicable, understandable, and practical tool. It helps organizations to become more aware of their status with respect to knowledge sharing and it helps to assess the effect of actions taken to stimulate knowledge sharing.

7.2 Assessment of the enabling conditions

The key element of our repeating process of assessment and action is the assessment of the conditions that facilitate knowledge sharing. As a possible assessment of these enabling conditions we propose to estimate their degree of fulfillment in the organization that is studied. For each identified social, organizational, and technological condition, Table 7.1 below can help to assess that condition and yield a representative value, for example on a scale from 1 to 10 (to indicate a *not present* up to a *completely fulfilled* condition). We

emphasize that the contents of Table 7.1 below should be seen as examples only, with a sole purpose to aid the process of assessing the conditions.

	Condition	Assessing its degree of fulfillment
Social	appraisal	Assess the level of appraisal within the organization by regarding: • unambiguous metric for contribution, usage, and effectiveness (Trussler, 1998); • a system to track employees' individual development and contributions (Gephart et al., 1996) and that tracks collective improvement as well; • the existence of a compensation and reward scheme that stimulates behavior conducive to knowledge sharing, which is incorporated in the way of working; • the number of rewards — with respect to knowledge sharing — that have been issued in a year.
	care	The level of care may be assessed through: • to honestly mean well for your personnel; • the number of genuine friendships that exist in the organization; • the existence of a buddy system.
	competence leverage	Competence leverage can be assessed through: • a system that can store competences and, related to the personal learning targets and to organizational unit learning targets, unambiguously measure growth in competences; • a system to track employees' individual development and contributions (Gephart et al., 1996) and that tracks collective improvement as well; • the yearly educational budget that is available per employee and that has been spent on formal training; • the number of knowledge fairs or knowledge transfer tours held last year (Gray, 2001; Garvin, 1993); • the existence of a library in the organization, its yearly budget, and the number of documents out on loan per year; • the amount of articles or lectures produced by employees last year (Weggeman, 2000); • the number of departments that function as knowledge-centers, centers of expertise, or bureaus of Lessons Learned (Weggeman, 2000); • the number of graduates that held a trainee post last year (Weggeman, 2000).
	empowerment	Assess empowerment in the following ways: • estimate the degree of autonomy of employees (look for example at the scheme that indicates who is authorized for expenditures of a certain amount); • investigate whether the (delegated) authority and the information flows are adequate to be in autonomous control of one´s daily workprocess.
	knowledge crew	Investigate the following questions to assess a knowledge crew: • is there a Chief Knowledge Officer in the organization and what is his or her position in the organizational hierarchy? • does the organization employ competency knowledge managers, and what is the ratio between the total number of competency knowledge managers and the total number of employees? • what is the percentage of line managers that also act noticeably as a line knowledge manager?
	trust	Assess the level of trust within the organization. This can be done through ranking of several aspects: • is the culture in the organization of a non-competitive nature; • does management 'walk the talk';

	Condition	Assessing its degree of fulfillment
	trust *(continued)*	• is trust an esteemed notion in the organization; • is it easy to have informal face-to-face contacts during working hours; • is it appreciated to have informal face-to-face contacts during working hours; • is it straightforward to have contacts with other employees, irrespective of geographical and organizational distances; • is there a buddy system; • is it common practice that employees help each other.
Organizational	climate of openness	A climate of openness may be assessed by: • the accessibility of (operational, business, and strategic) information; • the number of (critical) questions raised during organizational meetings; • the amount of openness perceived by employees (which can be rated through periodical reviews or discussed in exit interviews with employees who resigned); • the extent to which errors are shared and not hidden; • the number of contacts with other people and groups within and across organizational functions and units; • the number of employees that are involved in dialogue around specific issues and topics (Fahey and Prusak, 1998).
	collaboration	An assessment of collaboration may be found by estimating the number of projects or assignments employees work together with a perceptible shared responsibility, risk, and benefit.
	community	There are several ways to assess community within an organization: • the number of communities that communicate their existence to the organization, the number of members they have, and the frequency in which they meet; • the number of communities that maintain their own web page on the intranet; • the number of social events that take place yearly, and the number of people that visit them; • the number of brainstorm sessions, discussion sessions, and knowledge markets held yearly; • the volume of interactions across organizational units.
	dialogue	The way people treat each other in meetings when they disagree may give an indication about the amount of dialogue within an organization: do they dig their own trenches and do they not climb out of them?
	knowledge champion	An obvious assessment is the very existence of a knowledge champion, the number of employees that know a knowledge champion exists, the perceived approachability of a knowledge champion, and the number of employees that communicate — on a regular basis — with a knowledge champion.
	learning organization	A learning organization can be assessed through: • benchmarking against best practices of other organizations (perhaps even from a different industrial sector), this can monitor initial values and progress in organizational performance; • when the value of intellectual property is reflected in the book value this can function as a assessment for organization learning; • the amount of attention knowledge sharing receives in the annual report and whether it is emphasized that knowledge sharing is a critical factor for success (Kempen, 1999); • the level of systematic problem solving (Garvin, 1993); • the amount of new, state-of-the-art technologies that are applied (Garvin, 1993);

	Condition	Assessing its degree of fulfillment
	learning organization *(continued)*	• the number of changed ways of working (Garvin, 1993); • the number of successes and failures openly communicated (Garvin, 1993); • the number of accessible lessons learned (Garvin, 1993); • the number of benchmarkings taken place (Garvin, 1993); • the reach of knowledge transfer: within department, business unit, division, company-wide or intra-companies (Garvin, 1993); • the existence of an explicit plan for knowledge sharing, and the evaluation whether the formulated goals have been realized.
	metric	It is problematical to distinguish the relative contribution of knowledge sharing versus other factors when the organization improves its performance. Elliott (1997) suggests that it is therefore probably not productive to work out elaborate, unique measures for knowledge sharing. A possible type of assessment is the usage of the knowledge sharing tools: the frequency people are accessing knowledge repositories and the satisfaction about what was found or the frequency people are contributing to discussion groups (Elliott, 1997a; O'Dell and Jackson Grayson, 1997). But Fahey and Prusak (1998) propose to assess knowledge by its outcomes, activities, and consequences (like the money saved or earned, improvement in cycle time and customer satisfaction: Davenport et al., 1998a) rather than directly, for example by using the scope, depth, number, and quality of knowledge databases because these 'direct' indicators "do not provide any sense of an organization's stock or flow of knowledge or its contribution to decision making and organizational performance." The 'indirect' metric Fahey and Prusak (1998) are proposing may also include "patents, new products developed and introduced, customer retention, and process innovation."
	organically structured organization	Assessment whether the structure of an organization has an organic form may be done by considering: • the number of small, autonomous, cross-functional and networked organizational units; • the number of hierarchical layers; • the flexibility of the workforce: the number of cross-training, cross-divisional job assignments, and job rotations that occur (Gephart et al., 1996).
	slack	• Slack can be assessed by the percentage of time that employees are allowed to do whatever they like. Examine for example whether it is appreciated when employees take time to reflect behind their desk (that brings them in a kind of -dream-like state). • Another type of assessment of slack can be the number of employees that are overstrained.
	system integrated into daily workprocess	System integrated into daily workprocess can be assessed by: • the number of transactions a person has to execute before she or he can access stored explicit knowledge; • the number of systems an employee uses in her or his daily workprocess.
Technological	collaborative platform	An assessment for collaborative platforms within an organization can be the number of tools implemented that support collaboration between people and the frequency of usage of these tools.
	knowledge repository	A knowledge repository can be assessed through measurement of its usage: the number of people that can reach or access this repository, the frequency people are accessing this repository, the satisfaction about what they found there, and the range of the information and knowledge contained in the repository (Elliott, 1997a; O'Dell and Jackson Grayson, 1997; Keen, 1993).

	Condition	Assessing its degree of fulfillment
	knowledge route-map	Assessment of knowledge routemaps may be possible by evaluating: • the number of people from whom their expertise, experience, community, skills, the projects they are currently working on or were involved with, interests and affiliation are stored in the 'yellow pages' on the intranet of the organization; • the number of directory services that offer links to documents like research results, diagnostics tools, or frequently asked questions; • the frequency people are consulting these 'yellow pages' or directory services and their satisfaction about the content; • the frequency of updating the information in these 'yellow pages' or directory services; • the number of online learning possibilities that can be obtained, i.e. the number of electronically available trainings, courses, 'cookbooks', lectures, video journals, and seminars and the usage of these online learning possibilities.

Table 7.1: Assessment of social, organizational, and technological conditions

7.3 Indicating the level of knowledge sharing

The assessment of the enabling conditions as existing in the organization at hand is input for an instrument that enables us to derive an indication of the level of knowledge sharing in an organization. This instrument — that is described in detail in Appendix D (on page 227) — builds on a formula that is constructed from the conditions that facilitate knowledge sharing. In this formula we derive the probable level of knowledge sharing in an organization as determined by a (logarithm) function of its enabling conditions. Because we want to create an opportunity to indicate a possible variance in significance of these enabling conditions, we associate weights (i.e. coefficients) to these conditions.

The instrument employs a ranking of the enabling conditions to indicate a possible difference in the importance of these conditions for knowledge sharing. This ranking takes the knowledge sharing strategy — codification or personalization — of the organization into account. The ranking is also influenced by the type of the condition (social, organizational, or technological) and by the sequence of the knowledge sharing phases (because knowledge sharing in $phase_i$ builds on knowledge sharing in $phase_{i-1}$). We express the ranking — i.e. the coefficient of the condition — by an ordinal number.

Using this ranking, we can write our formula as a scalar product of two vectors in an *n*-dimensional space: the coefficients (in an ordinal scale) are multiplied with the log function of the ranked conditions (and where *n* is the number of enabling conditions). As we have presented in Section 7.2 (on page 114), assessment of each identified social, organizational, and technological condition can yield a representative value on a scale from 1 to 10. These values enable our formula to derive an indication of the level of knowledge sharing in an organization.

We note that the outcomes of this instrument may suggest an exactness that — due to the nature of knowledge sharing — does not hold in practice and therefore should be treated as such.

7.4 The applicable knowledge sharing phase

The indication of the level of knowledge sharing that we proposed in Section 7.3 (on page 118) helps us to determine, for the organization at hand, the applicable knowledge sharing phase. In order to do so, we first use the instrument that we introduced in Section 7.3 to derive — for each knowledge sharing phase in both knowledge sharing strategies — a numeric interval that gives an upper and lower limit of the level of knowledge sharing in that phase.

We therefore divide the possible interval of [0, 1] of the formula (for it is a logarithm function) into intervals associated with the knowledge sharing phases. In Appendix D (on page 227) is explained that each interval is derived using the ranking — i.e. their ordinal number — of the most appropriate conditions for this phase (exactly as given in Table 6.3 on page 111) as input for the formula. In this formula we assign each of these conditions its maximum value of 10, which results in a value of 1 because of its logarithm function. Consequently, the maximum value of an interval is obtained by adding all ordinal numbers of these conditions. This maximum value is also used to determine the upper limit of the phase at hand: it is added to the lower limit (which is the upper limit of the preceding phase). The lower limit of the first phase is 0, for this is the minimum value of the interval of the formula. The intervals of the knowledge sharing phases are presented in Table D.1 (on page 232).

Given the indication of the level of knowledge sharing we use this Table D.1 to determine which phase is applicable to the organization at hand, i.e. which phase — with its specific characteristics — typifies the development of the organization with respect to knowledge sharing. This indicated level of knowledge sharing comes from considering all the conditions, which are related to different knowledge sharing phases. Therefore, to be able to determine the phase that is applicable to this organization, we apply thresholds as defined in Table D.1. We consider a phase 'fulfilled' when the assessed value of the conditions related to that phase yield a value greater than or equal to its threshold. Because knowledge sharing in $phase_i$ builds on knowledge sharing in $phase_{i-1}$ we always check the first phase (in case of a codification strategy this is the knowledge repository phase, in a personalization strategy this is the collaborative platform phase) to see whether it is fulfilled. If so, we check the next phase until the threshold of the phase under scrutiny can not be passed. The last fulfilled knowledge sharing phase is the phase applicable to the organization at hand.

7.5 Select conditions to stimulate

In Section 7.4 we identified the appropriate knowledge sharing phase. As a result of our assessment of the enabling conditions we know the degree of fulfillment of the conditions that are related to this specific phase. Based on this degree of fulfillment we decide whether to enhance the current knowledge sharing phase (when the average value that results from the assessment is equal to or below 7, for example) or to facilitate a transition from the present into the next knowledge sharing phase. Related to either of these phases are enabling conditions as described in Table 6.3 (on page 111): these are the most suitable to stimulate and improve.

7.6 Feasible ways to stimulate conditions

In Table 7.2 below we describe feasible ways to stimulate the conditions that facilitate knowledge sharing. This may offer an organization practical insight how to improve conditions. As is shown in Figure 7.1 (on page 113) choosing which stimulating activities to undertake may be dependent on the knowledge sharing strategy (connect people to people or connect people to documents); the current issues (address and try to solve the most urgent problems); and the relevant trends (solutions should fit in future developments).

	Condition	Feasible ways to stimulate
Social	appraisal	• Appraisal can be implemented by defining and introducing a compensation and reward scheme (in more autonomy, more resources, virtual credits, attractive assignments, boosting someone's ego, time, position, or money) for contributing knowledge to the organization and for using knowledge from the organization. Incorporate this in the annual performance appraisal and evaluation process. This scheme needs to "motivate employees to continually increase their own capabilities and share knowledge" (Mohrman and Finegold, 2000). • Management needs to advocate a clear message that knowledge sharing is important to the organization and should show example behavior in this respect.
	care	• Care can be cultivated through stimulation of relationships by enhancing mentorship and coaching, shadow-consulting and counseling. • Establish "training programs in care-based behavior that show organization members care in practice and how to encourage care in relationships. The emphasis should be on learning how to help, present personal insights, develop concepts, and justify new ideas while exercising lenience in judgment" (Krogh, 1998).
	competence leverage	• Institute educational and development programs with individual learning targets to help employees develop at each career level and across organizational boundaries. • Define "two sets of responsibilities for the individual, each of which should grow proportionally: the responsibility to acquire expertise; and the responsibility to make your help accessible to those who need it as your expertise grows" (Krogh, 1998) and incorporate this into the human resource development practice (and appraisal system). • Establish "project debriefings and other forms of learning-oriented conversations that have sharing experience among project participants and enhancing the personal learning of each individual as the chief goals. After closing an innovation project, sufficient time is too seldom allocated to briefings and too little care devoted to helping each individual to get the most learning benefit out of the project. Good project briefings cover a review of the project goals and whether they were met, the individuals' experiences with working relationships, the key lessons learned by the individuals and by the team as a whole, the new methods and tools resulting from the project, the quality of the leadership exercised, as well as the knowledge and best practices to be transferred to other teams" (Krogh, 1998).

	Condition	Feasible ways to stimulate
	empowerment	• Empowerment can be stimulated through reducing the hierarchical layers in the organization, increasing autonomy for the employees, delegating authority, setting up an information repository in which information about organizational performance and relevant developments in the environment can be consulted by all employees, put emphasis on a team-focused way of working, and install quality circles for improvement of business processes.
	knowledge crew	• To implement a knowledge crew is to appoint a knowledge crew: assign employees who are specifically in charge for (encouragement of) knowledge creation and sharing, for searching, collecting, valuating, structuring, and distributing knowledge.
	trust	Trust can be developed over time by having people work together. Skyrme (1998) suggests the following practical approach for building trust: • communicate often: short and frequent communications help the process of dialogue and trust building; • make a small commitment and meet it — if you say "OK, I'll send that on to you", do so. Better not make a commitment at all than make one and miss it; do not over commit — a frequent problem of the professional perfectionist. I'd rather hear 'no' than 'yes' from a colleague, if that 'yes' is followed by repeated missed deadlines; • socialize — even informally by e-mail over the network. Informal conversation and identification of shared interests beyond the immediate business tasks, helps builds closer bonds; • demonstrate interest and commitment to the other person. Do things for them that will help them succeed.
Organizational	climate of openness	Some ways to stimulate a climate of openness can be: • to ensure easy accessibility of (operational, business, and strategic) information; • to create mutual respect across organizational functions and units.
	collaboration	• Collaboration can be facilitated by adapting business processes to collaboratively working and to support this way of working with appropriate tools (like workflow management or electronic forms). • Hauschild et al. (2001) suggests co-location of teams or departments: "Since personal meetings seem to be the best way of sharing tacit knowledge, 93 percent of the successful companies locate development teams in the same facilities used by groups with which they work closely, such as supplier teams."
	community	Community may be stimulated through these activities: • form teams having the same needs and interests that operate face-to-face as well through electronic media in order to solve business problems; • organize social events: "Social events, ranging from informal chats around the water cooler to holiday parties, can have a great effect on organizational relationships. Difficult personal issues can be discussed and resolved with colleagues, and time can be allocated to explore the interests of fellow organization members" (Krogh, 1998); • organize joined (long-term) trainings with participation by employees from distinct organizational units (perhaps selected on characteristics like age, gender, education, or position).
	dialogue	• Dialogue may be implemented by creating conditions of enough psychological safety so that people are not hold back to share their mental model with other people (Krogh, 1998; Schein, 1995a) and by training in the technique of dialogue.

	Condition	Feasible ways to stimulate
	learning organization	• A learning organization purposefully enhances and maximizes organizational learning to enable effective responses to a dynamic environment through knowledge creation, sharing, and use. Therefore an organization should set a collective ambition for the employees (Weggeman, 2000), try to attain double loop learning (Choo, 1998), and be equipped to deal with its relationship to and dependency on the environment.
	knowledge champion	The knowledge champion may encourage knowledge sharing through: • Davenport et al. (1998a): "sending messages that knowledge management and organizational learning are critical to the company's success, providing funding and other resources for infrastructure, and clarifying what types of knowledge are most important"; • Mohrman and Finegold (2000): "participating regularly in high-profile development programs, personally mentoring high-potential managers in different parts of the organization, having leaders publicly share cases where they made a mistake and the lessons they learned from this experience, recognizing individuals who took a carefully calculated risk that did not succeed, promoting leaders who actively share knowledge and develop talent to help the whole organization."
	metric	Metric can be implemented by (Elliott, 1997): • defining performance measures used to monitor a particular business function or business process; • develop a diagnostics tool (like questionnaires, benchmarking, and financial / economic performance indicators) to gain insight in the overall organizational performance.
	organically structured organization	An organically structured organization can be realized in the following manner: • to focus dominantly on the environment and customers (and not on internal divisions and rigidities) in order to improve the capabilities of the organization; • to redesign business functions, processes, and activities to accommodate teams with free information flow.
	slack	• An organization can offer employees resources to cope with the demands on their time. They can reduce demands, prioritize demands, focus only on a few critical activities, and reengineer or simplify work processes (Ulrich, 1998). An organization can also allow employees a percentage of their time to be spend on activities they chose themselves or perhaps set periods of the workday aside specifically for learning and sharing.
	system integrated into daily workprocess	• Systems can be integrated into daily workprocesses by understanding the daily behaviors of employees and expand existing systems accordingly or introduce systems that seamlessly work together with already existing systems and technology choices.
Technological	collaborative platform	A collaborative platform can be stimulated by installing (and to arrange for regular face-to-face contact between the users of these systems to increase acceptance and revenues of these tools): • groupware: electronic meeting systems or group support systems, chat systems, application sharing systems, screen sharing, shared whiteboards, collaborative virtual environments, (desktop) video conferencing systems, electronic project rooms, electronic discussion systems [for example electronic bulletin boards, discussion databases, and newsgroups] and co-authoring systems); • an enterprise wide intranet with web pages for each community and team and with web sites for specific business problems, topics, or issues.

	Condition	Feasible ways to stimulate
	knowledge repository	• Install an organization wide intranet containing digitally stored documents that contain for example articles, project documentation and evaluations, manuals, lessons learned, and best practices. Use web browsers or search engines (perhaps with full-text search) to access these documents.
	knowledge routemap	Several initiatives can be taken to facilitate knowledge routemaps: • make specialists and experts more visible by capturing the expertise of employees, their experience, community, skills, the projects they are currently working on or were involved with, their interests and affiliation and store this (and keep it up-to-date) on the corporate intranet (in the 'yellow pages' or in an integral skills-database) with easy access for colleagues; • buy or develop online educational material and offer access to this material through an organization wide intranet.

Table 7.2: Feasible ways to stimulate social, organizational, and technological conditions

In Appendix E (on page 235) we describe an approach that may steer and support the efforts to realize these stimulations.

7.7 A repeating process of assessment and action in practice

7.7.1 Steps of the process

We outlined our repeating process of assessment and action in Section 7.1 (on page 113) and we elaborated this further in the subsequent sections. In this subsection we recapitulate the steps that organizations may take to put this repeating process of assessment and action into practice. Implementation of the repeating process of assessment and action in our three case studies through these steps is described in the next chapter (Chapter 8 on page 127). The process is defined by the following initial activities:

- decide on the knowledge sharing strategy to be employed: the codification strategy or the personalization strategy;
- assess all enabling conditions, as present in the organization, through semi-structured interviews to estimate their degree of fulfillment and to yield a representative value on a scale from 1 to 10 (in the manner as proposed in Section 7.2 on page 114);
- use the values, that result from this assessment, of each identified social, organizational, and technological condition in the formula (as defined in Appendix D on page 227) to derive an indication of the level of knowledge sharing in an organization (as explained in Section 7.3 on page 118);
- this indicated level of knowledge sharing leads us, using Table D.1 (on page 232) and the relevant knowledge sharing strategy, to the applicable knowledge sharing phase (as described in Section 7.4 on page 119);
- use this identified knowledge sharing phase and the level of fulfillment of its related conditions to determine whether to enhance the current knowledge sharing phase (for example when the average value that results from the assessment of the enabling conditions is equal to or below 7) or to facilitate a transition from the present into the next knowledge sharing phase; in Table 6.3 (on page 111) we defined the relations between knowledge sharing phases and their most appropriate enabling condi-

tions: we therefore select the conditions that may be the most suitable to stimulate and to improve (as addressed in Section 7.5 on page 119);

- the knowledge sharing strategy influences the way these conditions will be stimulated (whether to put emphasis on connecting people with other people or on linking people to documents), moreover we correlate current issues or problems of this organization with possible, relevant trends to determine the most viable way to realize these stimulations (some possible ways to stimulate conditions are listed in Section 7.6 on page 120).

After some time the effect of these stimulations on the enabling conditions can be assessed in an organization as part of another process of assessment and action. The impact of the stimulating actions taken may result in a changed degree of fulfillment of enabling conditions and in an altered indicated level of knowledge sharing. This assessment can be used to monitor progress, judge results, and to evaluate the effectiveness of (one or more) conditions in facilitating knowledge sharing.

7.7.2 Comparison to the Transtheoretical Model of behavior change

The Transtheoretical Model of Behavior Change (Velicer et al., 1998; Evers, 2001) is an accepted model in medical science that tries to induce behavior change by recognizing different stages an individual may experience and by applying interventions — to adopt healthy behavior or to discontinue unhealthy behavior — that have been designed to optimally match these different stages.

The possible resemblance this model bears to our repeating process of assessment and action may strengthen our theory and therefore warrants a deeper examination. The Transtheoretical Model identified common principles of change and uses these principles to create an enduring change in the health risk behavior of individuals. The Transtheoretical Model is "based on twenty years of research, and has been successfully applied to a variety of health behavior areas, including smoking cessation, weight control, sunscreen use, high-fat diets, exercise acquisition, quitting cocaine, mammography screening, and condom use" (Evers, 2001).

The core constructs of the Transtheoretical Model are (Velicer et al., 1998; Evers, 2001):

Stages of Change

Individuals move through a series of Stages of readiness in the adoption of a healthy behavior or cessation of an unhealthy behavior. For a well-researched area like smoking cessation the Transtheoretical Model sees change as a process involving progress through a series of five stages: *Precontemplation* (the stage in which people are not intending to take action in the foreseeable future), *Contemplation* (the stage in which people are intending to change in the next six months), *Preparation* (the stage in which people are intending to take action in the immediate future), *Action* (the stage in which people have made specific overt modifications in their lifestyles), and *Maintenance* (the stage in which people are working to prevent relapse).

Outcome measures

These constructs are sensitive to progress through all Stages, they are measures to detect change. They include the *Decisional Balance* (this reflects the individual's relative weighing of the pros and cons of behavior change; for example in the Precontemplation stage, the pros of smoking far outweigh the cons of smoking) and the *Self-*

Efficacy / Temptation scales (that reflects the confidence that people have in the ability to cope with difficult situations without relapsing to their unhealthy habit; for example temptation is very high in the Precontemplation stage).

Processes of Change

These are independent variables consisting of ten cognitive and behavior activities that facilitate change and cause transitions between the Stages of Change. These interventions have been designed to optimally match the identified Stages of Change. The *Experiential Processes* are used primarily for the early stage transitions: Consciousness Raising (increasing awareness; interventions that can increase awareness include feedback, education, confrontation, interpretation, bibliotherapy, and media campaigns), Dramatic Relief (emotional arousal; psychodrama, role playing, grieving, personal testimonies, and media campaigns are examples of techniques that can move people emotionally), Environmental Reevaluation (social reappraisal; empathy training, documentaries, and family interventions can lead to re-assessments), Social Liberation (environmental opportunities; advocacy, empowerment procedures, and appropriate policies such as smoke-free zones can produce increased opportunities), and Self Reevaluation (self reappraisal; value clarification, healthy role models, and imagery are techniques that can move people evaluatively). The *Behavioral Processes* are used primarily for later stage transitions; Stimulus Control (re-engineering; avoidance, environmental re-engineering, and self-help groups can provide stimuli that support change and reduce risks for relapse), Helping Relationship (supporting; rapport building, a therapeutic alliance, counselor calls, and buddy systems can be sources of social support), Counter Conditioning (substituting; relaxation can counter stress, assertion can counter peer pressure, and nicotine replacement can substitute for cigarettes), Reinforcement Management (rewarding; contingency contracts, overt and covert reinforcements, positive self-statements, and group recognition are procedures for increasing reinforcement), Self Liberation (committing; New Year's resolutions, public testimonies, and multiple rather than single choices can enhance self-liberation).

The crux of our repeating process of assessment and action consists of assessing the enabling conditions that — according to our research — facilitate knowledge sharing. This assessment enables us to derive an indication of the level of knowledge sharing in an organization (i.e. the knowledge sharing phase). Based on this we may deduce which enabling conditions should be stimulated and how, in order to create a change in the organization to improve knowledge sharing.

When we associate change in human behavior with change in organizational behavior we can correlate the Stages of Change of the Transtheoretical Model (for behavior change evolves through different stages) with the knowledge sharing phases we defined in Chapter 6 (on page 91). And, based on the applicable Stage of Change of a person or on the relevant knowledge sharing phase of an organization, we see a distinct parallel between the activities that initiate and maintain a behavioral change of a person — through interventions and the Processes of Change — and the activities we defined in this research to stimulate the enabling conditions in an organization to facilitate a, possible lasting, improved level of knowledge sharing. This comparison may imply that the principles of an accepted theoretical model have a correspondence with our key concepts, which may encourage the applicability of our theory.

7.7.3 Comparison to the framework of Wiig

Wiig's et al. (1997) normative knowledge management model "distinguishes management activities that are related to an analysis of the organization and interventions that are related to basic knowledge operations that are aimed at solving the knowledge management problem" (Christoph et al., 2001). The four sequential activities of this model are: review, conceptualize, reflect, and act that correspond to our approach as follows.

Review

Review is an activity to collect facts about the organization, i.e. to comment on the history of the organization and on its status in terms of business indicators.

In our repeating process of assessment and action we assess the fulfillment of the enabling conditions for each organization under study, for we consider these conditions as the 'business indicators' for knowledge sharing.

Conceptualize

To conceptualize is to analyze aspects in the knowledge processes and domains, and to suggest improvements.

Based on the assessment of the social, organizational, and technological conditions, the maturity level with respect to knowledge sharing can be indicated. This indication may be of help in creating awareness about the particular stage of development of the organization and the subsequent steps needed to improve this situation (i.e. enhance the current knowledge sharing phase or induce a changeover to the next phase).

Reflect

The reflect activity should result in possible improvements. These improvements are to solve identified problems.

Enabling conditions that are the most appropriate to stimulate are selected in our repeating process of assessment and action (through our defined relationships between knowledge sharing phases and enabling conditions and the degree of fulfillment of the conditions) as well as the most viable way to execute these stimulations (through examination of current problems and possible trends).

Act

Act is about the execution of proposed plans to realize the improvements.

In our repeating process of assessment and action we associate act with the actual stimulations of the selected conditions.

We express the view that comparison of the framework of Wiig to our repeating process of assessment and action may improve credibility of our approach.

7.8 Conclusion

In this chapter we presented a repeating process of assessment and action in order to be able to implement our prescriptive conceptual model (that we defined in Chapter 6 on page 91). In the next chapter we apply our repeating process of assessment and action to the case studies Getronics Consulting, the Ministry of Housing, Spatial Planning, and the Environment and Unilever Research & Development Vlaardingen. This will result in three prescriptive empirical models and denotes the next step of the inductive-hypothetical model cycle.

8 ENABLING KNOWLEDGE SHARING IN PRACTICE

Where is the knowledge that we have lost in information?
T.S. Eliot

8.1 Introduction

We defined in Section 2.2 (on page 12) our research goal as follows: "*Identify the relevant conditions and enablers that facilitate knowledge sharing between people in an organization.*" In Chapter 5 (on page 65) we identified and presented conditions that we consider as facilitators of knowledge sharing in an organization. To validate that these conditions indeed influence and enable knowledge sharing we propose to (as mentioned in Section 7.1 on page 113) "assess the degree of fulfillment of the enabling conditions, undertake appropriate activities to improve these conditions, and evaluate whether the level of knowledge sharing has changed" for organizations in real life.

For that reason we describe in this chapter the implementation of our prescriptive conceptual model (that was defined in Section 6.9 on page 102) — as the next step of the inductive-hypothetical model cycle — through a process of assessment and action (that we described in Chapter 7 on page 113). We therefore follow the steps of our repeating process of assessment and action (as elaborated in Subsection 7.7.1 on page 123) in three case studies: Getronics Consulting, the Ministry of Housing, Spatial Planning, and the Environment, and Unilever Research & Development Vlaardingen to yield three prescriptive empirical models.

For each case we give a short general description and we present their way of working. Their social, organizational, and technological factors that are related to knowledge sharing processes are observed and the fulfillment of their enabling conditions is assessed. We pinpoint their knowledge sharing strategy, reason about the knowledge sharing phase that may be applicable and select which enabling conditions seem the most appropriate to stimulate.

We analyze current organizational problems and possible future developments of each case to identify directions for improvements. This enables us to propose suitable ways to stimulate the selected conditions. We suggest an approach to realize these stimulations and we discuss the resulting situation.

8.2 Case Getronics Consulting revisited

In Section 4.2 (on page 42) we introduced and discussed the case study Getronics Consulting. We analyzed this consultancy firm through human, organizational, and technological factors that may have an influence on their knowledge sharing processes. We will use those findings to report in this section on the implementation of our repeating process of assessment and action in this organization.

As formulated in Section 7.7 (on page 123), the initial step of our repeating process of assessment and action correlates with the chosen knowledge sharing strategy. We decide

that Getronics Consulting operates under a personalization strategy for most consultancy services are unique and customized. Our next step is to assess the enabling conditions, as they exist today in Getronics Consulting.

8.2.1 Assessment of existing conditions

We use our experience as a long-term employee and the findings on Getronics Consulting as described in Section 4.2 (on page 42) to assess the fulfillment of the conditions existing in this organization. Following Section 7.2 (on page 114) we define the representative value of a condition in the interval between 1 and 10 (to indicate a *not present* up to a *completely fulfilled* condition). For each value assigned we justify our assessment.

	Condition	Value	Justification
Social	appraisal	**1**	With regard to knowledge sharing no rewarding or compensation takes place in Getronics Consulting.
	care	**1**	Only a very limited number of warm, social relationships exist between the consultants of Getronics Consulting. Care, in the meaning of warm, genuine interest in a colleague demands investing time and that is only scarce available. Consultants concentrate primarily on their own, individual interests.
	competence leverage	**3**	A small amount of managed competence leverage occurs. No system is present that registers competences or tracks the individual development of consultants. Competencies are, as a rule, improved in practice through execution of assignments.
	empowerment	**2**	Consultants enjoy a high degree of autonomy in the fulfillment of their assignments. However, within Getronics Consulting consultants are not involved in organizational changes and have only very limited organizational control.
	knowledge crew	**2**	Getronics Consulting does not employ any staff that is occupied with (stimulation of) knowledge sharing. Nevertheless, we assign a small value to this condition because a webmaster for the intranet is employed.
	trust	**3**	The level of trust is rather low. The assignments are typically realized on an individual basis. Face-to-face contacts do not take place often as consultants do not meet each other regularly. Most consultants tend to be competitive.
Organizational	climate of openness	**2**	There is only a limited degree of openness in this organization: relevant information is not easy accessed, raising critical questions (for instance about internal affairs) is not appreciated, in general experiences and errors are not shared, and there is not much contact with consultants from other business units.
	collaboration	**5**	The way of thinking within Getronics Consulting concentrates on having assignments carried out by individuals and not that much collaboration takes place. However, in situations where consultants should undertake a shared effort, for instance in the preparation of tenders, genuine collaboration comes about.
	community	**2**	No flourishing communities exist in this consultancy firm. Some groups exist and they are commonly formed around large customers, but because shortly after they are conceived these groups become rather inactive we cannot classify them as communities.

	Condition	Value	Justification
	dialogue	**3**	Dialogue occurs in Getronics Consulting only in the so-called OKE-sessions (see the section on Systems in Subsection 4.3.4 on page 55 for an explanation) where a context and atmosphere is created in which multiple viewpoints on a specific subject are explored.
	knowledge champion	**1**	There is no member of topmanagement of Getronics Consulting who realizes the possibilities of knowledge sharing and acts accordingly.
	learning organization	**2**	Getronics Consulting scores low on the condition learning organization. Through its so-called spearheads it tries to maintain a hold on the changing environment and the demands customers in such an environment may have. But it does not have a capacity to learn, or an inclination to share knowledge, and neither does it create opportunities to improve itself.
	metric	**1**	As no knowledge sharing occurs in a structural manner also no metric for measuring this behavior are institutionalized in Getronics Consulting.
	organically structured organization	**6**	We observed in Subsection 4.3.4 (on page 55) that the structure of Getronics Consulting is moderately flat, low on formalities, market oriented, and arranged around the individual consultant (rather than around the team). However, this does not result in a very high score because the business units are self-contained entities rather than networked organizational units.
	slack	**1**	Consultants are not allowed to spend a percentage of their working time according to their own free will. Emphasis is put on the short term, i.e. on the maximum billability of the employees.
	system integrated into daily workprocess	**2**	The only system that may support knowledge sharing within Getronics Consulting is their intranet. However, we contended in the section on intranet in Subsection 4.2.5 (on page 46): "The intranet forms no part of the day-to-day business operation for the consultants."
Technological	collaborative platform	**4**	Electronic interaction between consultants of Getronics Consulting restricts itself to e-mail and an electronic discussion forum on the intranet. The e-mail functionality is used intensively, very to the contrary of the discussion forum.
	knowledge repository	**5**	The intranet of this consultancy firm does offer only a limited amount of explicit and up-to-date knowledge such as the description of a few technologies, methods, and skills.
	knowledge routemap	**3**	No curricula vita of the consultants or data about their expertise is searchable in the intranet of Getronics Consulting. Neither does it offer links to documents that describe research results or does it list frequently asked questions or expert opinions.

Table 8.1: Assessment of conditions existing in Getronics Consulting

These results are depicted in Figure 8.1 below. We can see from this picture that the fulfillment of the social conditions is rather low, the organizational conditions are in a slightly better state, and the technological conditions are present with average or below average values.

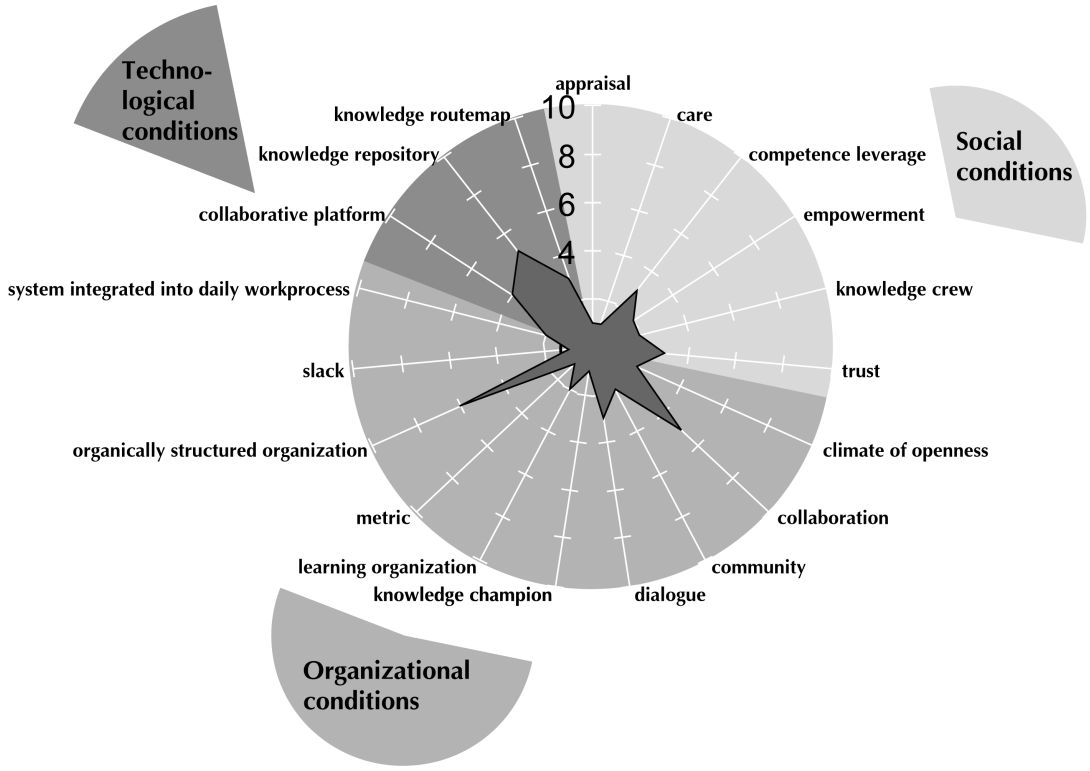


Figure 8.1: Assessed conditions in Getronics Consulting

8.2.2 The applicable knowledge sharing phase

We follow the ensuing steps of our repeating process of assessment and action (as described in Section 7.7 on page 123). The values that result from the assessment of the enabling conditions (as denoted in Table 8.1 on page 129) enable us to derive an indication of the level of knowledge sharing in Getronics Consulting (as defined in Appendix D on page 227). This leads us, using Table D.1 (on page 232), to the *unawareness phase* as the phase that indicates the level of development with respect to knowledge sharing in Getronics Consulting.

8.2.3 Selection of conditions most appropriate to stimulate

An organization in the unawareness phase does not address knowledge sharing (as remarked in Section 6.3 on page 95). In Subsection 4.2.6 (on page 47) we addressed a number of knowledge sharing activities that may improve the way of working in Getronics Consulting. Therefore we consider knowledge sharing relevant to an organization like Getronics Consulting and we encourage a transition from the unawareness phase into the next knowledge sharing phase: the collaborative platform phase.

As indicated in Table 6.3 (on page 111) the following conditions are related to the collaborative platform phase: care, appraisal, competence leverage, trust, empowerment, climate of openness, slack, dialogue, community, collaboration, knowledge champion, and collaborative platform. Consequently, these are the conditions that we select to stimulate and to improve.

8.2.4 Proposed stimulations of conditions involved

Considering the knowledge sharing strategy of Getronics Consulting, our analysis of this organization, and the findings mentioned in Table 4.1 and in Table 7.2 (on page 51 and 123 respectively) we suggest the following stimulations of these selected conditions:

Care

- Care can be cultivated through stimulation of relationships by stating "trust, openness, and courage as explicit values by topmanagement, and as formulated expectations for the behavior of organization members. Explicitly stated values … need to be visible in everyday managerial actions" (Krogh, 1998).
- Introduce mentorship and coaching (to help juniors), shadow-consulting and counseling (to help peers); supply relevant training in coaching and counseling techniques.
- Introduce a buddy system for new employees.
- Facilitate frequent informal face-to-face contacts between consultants; organize social events, create rooms where social interaction can take place, and permit consultants time to participate.
- Allow consultants a predetermined portion of slack in their workload for study, coaching, counseling, socializing with colleagues, and so on.
- Select new personnel who seem to be capable of having genuine interest in other people.
- Install "an incentive system with particular focus on access to help and other behavior that builds up care in organizational relationships. … Incentive systems should … be tightly coupled both with explicitly formulated values of care and with training programs in helping. … Performance appraisals should emphasize helping behavior towards younger colleagues and accessibility to the time and attention of experts. Furthermore, each member of the organization should be assessed on her interest in and commitment to building up trust in her relationships with colleagues" (Krogh, 1998).
- Establish "training programs in care-based behavior that show organization members care in practice and how to encourage care in relationships. The emphasis should be on learning how to help, present personal insights, develop concepts, and justify new ideas while exercising lenience in judgment" (Krogh, 1998).

Appraisal

- Appraisal can be implemented by defining and introducing a compensation and reward scheme (in more autonomy, more resources, virtual credits ('knowledge miles'), attractive assignments, boosting someone's ego, time, position, or money) for contributing knowledge to the organization and for using knowledge from the organization. Incorporate this in the annual performance appraisal and evaluation process. This scheme needs to "motivate employees to continually increase their own capabilities and share knowledge" (Mohrman and Finegold, 2000).
- This scheme should not only recognize and reward individual performance but collective improvement as well (O'Dell and Jackson Grayson, 1997), because "Cultures that primarily reward individual creativity and innovation have different patterns of interaction around knowledge than cultures where uncovering and leveraging existing expertise — from almost any source — is the norm" (Long, 1997).
- Introduce long term career-wise relationships between a consultant and a representative from topmanagement.

- Reward and give recognition to organizers of OKE-sessions (i.e. the knowledge transfer sessions) and do this in a way visible for the whole organization.

Competence leverage

- Institute educational and development programs with individual learning targets to help consultants develop at each career level and across organizational boundaries. "Instead of just having employees' targets tied directly with a business unit's performance, such as sales or quality control, an organization can start requiring employees to target what their knowledge acquisition will be in the next period. Will they team a new skill, understand a process they currently do not, improve the design of a computerized report, or extensively study a competitor, channel or product?" (Bontis, 1996).
- Define "two sets of responsibilities for the individual, each of which should grow proportionally: the responsibility to acquire expertise; and the responsibility to make your help accessible to those who need it as your expertise grows" (Krogh, 1998) and incorporate this into the human resource development practice (and appraisal system).
- Introduce a system in which the competences of every consultant can be registered and that can track the individual development of consultants.
- Reserve sufficient funds for formal training like courses and seminars and "adopt a broad view of development, recognizing activities beyond formal education and training" (Mohrman and Finegold, 2000) to ensure (budgetary) attention is also given to aspects like training 'on the job', mentorship, and coaching. Assign an 'education & training' advisor.
- Enhance mentorship and coaching, institutionalize shadow-consulting and counseling, and introduce a buddy system for newly hired consultants.
- Stimulate and facilitate brainstorm sessions, discussion sessions, and project progress meetings for knowledge transfer of attended courses and seminars, and of lessons learned.
- Institute "project debriefings and other forms of learning-oriented conversations that have sharing experience among project participants and enhancing the personal learning of each individual as the chief goals. After closing an innovation project, sufficient time is too seldom allocated to briefings and too little care devoted to helping each individual to get the most learning benefit out of the project. Good project briefings cover a review of the project goals and whether they were met, the individuals' experiences with working relationships, the key lessons learned by the individuals and by the team as a whole, the new methods and tools resulting from the project, the quality of the leadership exercised, as well as the knowledge and best practices to be transferred to other teams" (Krogh, 1998).
- Create competence centers and appoint competency knowledge managers.
- Stimulate job rotation within type of assignments, business units of Getronics Consulting, and within the Getronics Group.
- Critically evaluate in the selection process of new employees their motivation and ability to share knowledge.

Trust

- Create possibilities for the building of trust between consultants: facilitate more informal face-to-face contacts: people in the field need socialization to create a feeling of belonging.
- Have assignments not carried out by only one individual consultant, but have these assignments performed in teams with shared responsibilities.

- Select new employees on their ability to perform teamwork.

Empowerment

- Stimulate empowerment by involving the consultants in organizational changes, after all they also often advise their customers in this domain.
- Transfer some of the organizational control from the management at the home base to the consultants, their close contact with customers ought to be reflected in the business strategy.

Climate of openness

- Stimulate a climate of openness by ensuring easy accessibility of (operational, business, and strategic) information for all consultants.
- Provide abundant opportunity to meet with other consultants and other business units (inside Getronics Consulting and outside, physically and virtually).
- Create mutual respect across organizational functions and units.
- Have topmanagement to show example behavior in this respect.
- Encourage risk-taking and stimulate experiments, thereby refraining from punishing failures but by using them as opportunities to learn.

Slack

- Allocate to consultants a percentage of their time to spend on learning and sharing activities they chose themselves. Relate this percentage to the seniority of the consultant.
- Introduce a system that allows a consultant to take a sabbatical year after for example five years of service.

Dialogue

- Train employees in the technique of dialogue.
- Intensify the number of so-called OKE-sessions (see the section on Systems in Subsection 4.3.4 on page 55: an OKE-session offers a possibility to explore multiple viewpoints).
- Facilitate brainstorm sessions, discussion sessions, workshops, monthly meetings, and knowledge markets on specific (hot) topics or on solutions applied to solve problems of customers. Allocate the necessary time to attend these sessions.

Community

- Stimulate community by forming teams to realize assignments, or bring consultants together that have a specific expertise, or assemble teams around specific customer branches. Allow these communities to meet when the working day is not completely over yet.
- Create directory and membership services that support the building of communities.
- Organize social events. “Social events, ranging from informal chats around the water cooler to holiday parties, can have a great effect on organizational relationships. Difficult personal issues can be discussed and resolved with colleagues, and time can be allocated to explore the interests of fellow organization members” (Krogh, 1998).
- Install councils to develop and share best practices and install task teams across the various business units to pull together current knowledge on these practices and develop shared approaches (Mohrman and Finegold, 2000).
- Hauschild et al. (2001) propose: “Create networks through regular training with internal and external experts.”

Collaboration

- Facilitate collaboration by having more assignments carried out in teams rather than by individuals.

- Enhance the already existing collaboration, for instance in the preparation of tenders, by deploying appropriate tools.

Knowledge champion

- Employ a new topmanager as knowledge champion for Getronics Consulting who understands the need for knowledge sharing and acts accordingly. A knowledge champion is "especially important to a Knowledge Management project because major cultural change is required, beginning at the top" (Bair and Hunter, 1998).
- Topmanagement should, according to Davenport et al. (1998a) be: "sending messages that knowledge management and organizational learning are critical to the company's success, providing funding and other resources for infrastructure, and clarifying what types of knowledge are most important to the company."
- Topmanagement should, according to Nevis et al. (1995): "frequently interact with members [i.e. consultants] and become actively involved in educational programs."
- Topmanagement should, according to Mohrman and Finegold (2000) be: "participating regularly in high-profile development programs, personally mentoring high-potential managers in different parts of the organization, having leaders publicly share cases where they made a mistake and the lessons they learned from this experience, recognizing individuals who took a carefully calculated risk that did not succeed, promoting leaders who actively share knowledge and develop talent to help the whole organization."
- Topmanagement should, according to Elliott (1997a): "identify successes in your organization that resulted from more effective access to and sharing of knowledge … use them to build support and understanding."
- Topmanagement should, according to Fahey and Prusak (1998): "help individuals identify their current and desired knowledge roles and ask individuals to identify knowledge implications for group behaviors and processes."
- Topmanagement should, according to Gephart et al. (1996) be: "providing systems that facilitate learning, encouraging people to contribute new ideas, ensuring the dissemination of knowledge and learning, and freeing resources in order to signal the organization's commitment to learning."
- Organize an outdoor development program for topmanagement so that they can experience what the behavior under the new situation will feel like (Hope and Hendry, 1995): "This prevented the cultural change becoming a prayer to be memorized and recited. Instead the change was based around actions rather than only thoughts. The senior management were able to live out the behavior rather than merely exhorting others within the organization to behave in a certain way."

Collaborative platform

- Stimulate a collaborative platform through installing electronic meeting systems or group support systems, chat systems, collaborative virtual environments, (desktop) video conferencing systems, electronic project rooms, electronic discussion systems, and co-authoring systems. Arrange for regular face-to-face contact between the users of these systems and encourage usage of these systems.

8.2.5 Suggested approach and result

We reflected in Section 4.4 (on page 62): "an important step forward for Getronics Consulting may lie in realizing the values and possibilities of knowledge sharing, to facilitate a free flow of thoughts and ideas, and to have assignments not carried out by only one individual

consultant, but have these assignments executed in teams." The approach we suggest starts with creating awareness among management about the virtues of knowledge sharing and tries to solve the most urgent organizational problems using knowledge sharing.

The suggested approach consists of the following steps:

- Launch a workshop for the management of Getronics Consulting about the concept and the potential of knowledge sharing.
- Analyze and assess the current situation with respect to knowledge sharing in Getronics Consulting (as reported in Sections 4.2 and 8.2 on page 42 and 127 respectively).
- Decide on a small subset from the possible stimulations of the most appropriate conditions that we proposed in Subsection 8.2.4 (on page 131) that will have the highest value proposition. A value proposition is an exploration of which activities may have the greatest positive impact on people and the way of working (Elliott, 1997a). This exploration should, according to Hartz et al. (2001), "find the greatest areas of 'pain' within your organization. Find redundant efforts, discover areas where knowledge is lost, and find points of frustration in your employee base." On a perceived effort versus returns balance we select the following stimulations:
  1. Define and introduce a compensation and reward scheme for contributing knowledge to the organization and for using knowledge from the organization.
  2. Institute "project debriefings and other forms of learning-oriented conversations that have sharing experience among project participants and enhancing the personal learning of each individual as the chief goals.
  3. Employ a new topmanager as knowledge champion for Getronics Consulting who understands the need for knowledge sharing and acts accordingly.
  4. Have assignments not carried out by only one individual consultant, but have these assignments performed in teams with shared responsibilities.
  5. Institute educational and development programs with individual learning targets.
  6. Allocate to consultants a percentage of their time to spend on learning and sharing activities they chose themselves.
  7. Introduce mentorship and coaching (to help juniors), shadow-consulting and counseling (to help peers); supply relevant training in coaching and counseling techniques.
  8. Facilitate frequent informal face-to-face contacts between consultants.
  9. Install "an incentive system with particular focus on access to help and other behavior that builds up care in organizational relationships" (Krogh, 1998).
  10. Stimulate community by forming teams to realize assignments, or bring consultants together that have a specific expertise, or assemble teams around specific customer branches.
- Arrange a workshop for the management of Getronics Consulting to inform them about the results of the previous two steps. Let management decide on the priorities of the actions to be taken based on the value proposition: what do they want to do first.
- Realize the identified and prioritized stimulations. (Steer and support these efforts through operation of stage 1: 'enter and advocate' and stage 2: 'experiment, assess, and pilot' as presented in Appendix E on page 235.)
- Assess the impact of the actions taken as explained in Subsection 8.2.1 (on page 128).
- Organize a workshop for the management of Getronics Consulting to inform them about the obtained results and to determine the next steps.

This approach was, regrettably, refused by the management of Getronics Consulting. Management argued that the costs involved are too high: this demonstrated that a willingness to invest in knowledge sharing does not exist at the moment. We already remarked in the section on Style in Subsection 4.2.4 (on page 44): "Topmanagement is very busy in managerial issues (such as merging and integration of formerly distinct organizations) and seem not inclined to invest heavily (through time, money, actions, statements, or behavior) in 'new' and 'difficult' things like knowledge sharing, probably because its potential or added value is not clearly realized." Perhaps it may have helped when the expected qualitative and quantitative benefits of the selected stimulations would have been available to make the subject less conceptual and the results of the efforts more tangible.

My personal experience underlines that because of a rapid succession of intensive merging processes the internal organization was not completely settled yet; in fact nobody really cared about knowledge sharing. A destabilizing environment with a large turnover of labor in consultancy services came into being to make things worse. In addition, market circumstances deteriorated. This necessitated management of Getronics Consulting to put the plans with respect to knowledge sharing on ice, and to focus on the short term instead.

8.3 Case Ministry of Housing, Spatial Planning, and the Environment

We introduce in this section the case study Ministry of Housing, Spatial Planning, and the Environment of the Netherlands. This organization was selected for its interest in knowledge sharing and its need for connectivity of people and information systems. The Ministry is responsible for coordinating environmental policy at government level and has different characteristics (for example when we consider the type of industry, profit / not-for-profit character, total money flow, and number of employees) and organizational processes than the other case studies.

We collected the data of this case study through consultation of several sources: interviews, observations, internal publications, documents, reports, web-sites, and archives.

Members of the Taskforce Knowledge Management of the Ministry selected a sample of possible interviewees. These interviewees included topmanagement, line management, and policy-makers. These people were nominated because they are expected to be in a position to discuss a variety of aspects about knowledge sharing. Another criterion applied was that a fair representation of all divisions within the Ministry was made. The selected people received an introductionary e-mail that explained the process as it would probably happen, and were asked for their cooperation. These e-mails were followed by phone calls to make the appointments for the interview. These appointments were confirmed and a short explanation of our method was sent to the interviewee.

The focal point of an interview is to assess the fulfillment of the 19 enabling conditions. The interview protocol consisted of asking an assessment on the fulfillment for each condition — on a scale from 1 to 10 — and a justification for this perception. The managers were also asked to express the importance of knowledge sharing for the Ministry. These interviews were held in June and July 2001 and each lasted about one hour. Within this timeframe not all 19 conditions could be assessed in each interview.

A total of 15 in-depth interviews were conducted (one person was visited twice, and one interview was held with two interviewees). They were conducted by the researcher and in the majority of cases the chairman of the Taskforce Knowledge Management of the Ministry was present. The notes that were taken during the interview were transcribed and eventually ordered and combined per condition.

The qualitative data gathered in the interviews were analyzed, thereby using internal documents about knowledge sharing in the Ministry. The outcome of this analysis was first discussed with the chairman of the Taskforce Knowledge Management. Subsequently the results of the study were conveyed to the interviewees.

8.3.1 Description

The Netherlands is a densely populated country with a strong economic growth where issues concerning space have to be considered carefully. The aim of the Ministry of Housing, Spatial Planning, and the Environment is to make living, working, recreation, and moving inside the Netherlands pleasant. It is therefore responsible for coordinating environmental policy at government level. The Ministry wants to develop a high degree of environmental consciousness by stimulating inhabitants and companies in the Netherlands to approach issues on nature, environment, and raw materials in a responsible way.

The Ministry establishes conditions for the above in agreement with citizens, interest groups, and (social) organizations. It creates regulations and distributes subsidies for improving the country's living environment — with an emphasis not only on today, but also on future generations. The main overall objective of the Ministry is: "Working for a permanent and sustainable quality of the living environment." Important guidelines to realize this objective are the following:

Freedom in responsibility
Citizens are free to make decisions in a socially responsible way.

Sustainable development
Managing the living environment, energy, raw material, and nature in a way that will allow future generations to benefit from them optimally.

Diversity
The quality of the living environment.

Social justice
Satisfying expectations and wishes of the public as well as being considerate towards the weak in our society.

8.3.2 Way of working

The Ministry is a political organization operating under the leadership of the Minister and the State Secretary. The Minister and the State Secretary carry responsibilities to the Lower House of the Parliament — who act as representatives of the Dutch people —, for example with respect to the spending of the tax money that is disposed to the Ministry.

The central government makes decisions on national issues. Provincial and municipal councils have their own decision-making power on regional and local levels. National policy naturally restricts the powers of local and regional governments. The Ministry

chooses not to act as an executive organ. It functions primarily as a policy making body that creates favorable circumstances for others, whereby a public participation democracy is promoted in which decision-making powers are kept as close as possible to the local level.

Formulation and execution of the policy of the Ministry takes place in close cooperation with various international and domestic partners. The main operational processes are carried out in tree mutually dependent organizational Directorates-General: housing, spatial planning, and environmental protection.

The government's main priorities with respect to housing are quality (for the majority of the current, basic demands of the public are satisfied) and the right to choose (for individuals want to have an increasing influence on their own housing environment). An important aspect of the policy is to ensure that sufficient inexpensive housing facilities are available for the lower-income groups and for persons with specific needs like the elderly and the disabled.

The spatial planning policy focuses on several interrelated issues: cities and the country-side, mobility and infrastructure, the mainports Amsterdam Airport Schiphol and Rotterdam Harbor, and water management.

The policy with respect to environmental protection addresses themes as: the negative effect of ongoing economic growth and extensive leisure activities in a highly populated area, effective international cooperation to tackle environmental issues (like climate change, acidification, eutrophication, toxic and hazardous substances, contaminated land, waste disposal, disturbance, and groundwater depletion), and noise and light pollution.

Two additional organizational sections of the Ministry are:

- to plan, to conduct, and to supervise the building of projects in government housing;
- inspection and enforcement of relevant laws and regulations for all areas of policy (for example controlling waste material transport or the use of proper energy saving methods).

8.3.3 Social, organizational, and technological factors

In this section we observe the social, organizational, and technological factors in the Ministry of Housing, Spatial Planning, and the Environment that are related to knowledge sharing processes.

8.3.3.1 The human factor

We argued in Section 3.5 (on page 30) that three elements of human behavior could be related to knowledge sharing: a person's motivation, skill level, and organizational role.

The motivation of the Ministry's four thousand employees will (in general) be positively stimulated through the character of their work. Their efforts will — of course in varying degrees — influence the living environment of the people in the Netherlands, i.e. one creates a very visible and meaningful product. Realization of this product takes place in

frequent personal, face-to-face contacts; Kwast (2001) observes: "talking, discussing, and having contact with colleagues is regarded as very important."

The employees of the Ministry have a diverse educational level. Generous educational and training facilities and possibilities exist for all, and the Ministry maintains a special Educational Center as well as a Career Advice Center. Ingen Housz (2000) reports that the career planning policy aims to increase the deployment of the employees through stimulation of working temporarily at other departments and other type of jobs, through education, and by means of job rotation. Plans exist for a company-wide competence management system (already some pilots are underway), in which personal development programs are composed based on the (future) organizational needs — Back (2001) mentions the already defined desired competencies of collaboration, and knowledge effective and environment focused working —, the existing skills and expertise of a person, his or her interests, a possible migration path to attain the desired situation, and ways to transfer and share one's knowledge.

Some departments in the Ministry tentatively appointed employees to a post specifically designed to stimulate knowledge sharing. Using our definitions of Subsection 3.5.2 (on page 33) they can be classified as line knowledge managers. These employees feel they lack support of the organization to do their job satisfactory.

8.3.3.2 The organizational factor

In accordance with Section 3.6 (on page 34) we study the organizational aspects that can influence knowledge sharing through typification of the kind of organizational learning, by observing the (7S framework) dimensions, and by addressing the organizational culture.

We characterize the learning within the Ministry as single loop or adaptive learning: the organization is capable, albeit sometimes slow, to react to changes in the environment, and — for some aspects — it also manages and controls these changes. However, the official organization gives the impression that it operates dominantly according to proven methods, although its capacity to deal with situations in new ways is growing (for example cooperation irrespective of internal and external organizational boundaries is intensified).

The organizational dimensions of the Ministry of Housing, Spatial Planning, and the Environment can be typified as follows:

Strategy

Back (2001) reports that the mission of the Ministry is — using the guidelines freedom in responsibility, sustainable development, diversity, and social justice (as mentioned in Subsection 8.3.1 on page 137) — translated into steering and control, roles, and responsibilities on several managerial levels. The efforts to anticipate on developments in society and politics will — as a principle to be pursued — increasingly occur in an integrated, concerted, and synergetically manner.

Knowledge sharing — with a key role for the employee — is seen as an instrument to facilitate the transition from a somewhat segmentalist behavior to a more integrated way of working. Accordingly, control and structure are to be adapted to accommodate decision-making more based on knowledge instead of hierarchical positions or the organizational departments involved (Back, 2001).

Structure

As said, the Ministry operates under the political leadership of the Minister and State Secretary. It is led by the Secretary-General. The main organizational division of the Ministry is into three Directorates-General: for housing, spatial planning, and environmental protection. There also exists an Inspectorate-General for inspection. The government housing activities are provided by the Government Buildings Agency.

Back (2001) observes that knowledge sharing is influenced by the organizational structure and the way of working. In view of this, an ambition exists to alter the organizational structure, which at present sometimes gives an inkling of hierarchy and compartmentalization. Three programs are well underway (Ingen Housz, 2000; Back, 2001): joint responsibilities, employee pools, and knowledge domains. Joint responsibilities are created through the increasing cooperative behavior between departments (in projects, committees, study groups, and so on) to realize policies and solutions for which they hold a shared responsibility. The employee pools bring together staff (often with a special expertise) that can be employed Ministry-wide, i.e. irrespective of their organizational unit. Knowledge domains (that are mostly present at the moment in the Government Buildings Agency but will be defined organization wide) indicate which areas of discourse are of interest to the Ministry, for example Green space, City, and Infrastructure & mobility. In these knowledge domains, employees — who should come from all organizational units — convene to share, develop, and record ideas, thoughts, and knowledge on such a theme.

Systems

We defined systems in Subsection 3.6.1 (on page 34) as the framework of procedures to facilitate the business processes and that support communication, coordination, and collaboration in the organization. (Contracting out) Research and analysis is an important part of the way of working in the Ministry, which should be facilitated by adequate procedures. These procedures should give insight (also for related topics) what research and analysis already has been done, what is underway, and which plans exist. Moreover, distribution of concluded research and analysis should be given appropriate attention.

We observed that a lot of communication is done through personal networking on a face-to-face basis. This can function as effective ways of distributing internally and externally generated knowledge throughout an organization (Hauschild et al., 2001). These information flows gradually change from a vertical nature (for example within a Directorate-General) to a horizontal nature. Goals are set to put tools into operation to improve internal communication and cooperation (an example is the way newly hired — i.e. high-school and university graduates — employees go through an extensive introductionary program), to encourage sharing and re-usage of knowledge, and to improve the organizational information supply (Ingen Housz, 2000; Back, 2001). We discuss supportive tools like an organization-wide intranet in Subsubsection 8.3.3.3.

Staff, skills

We addressed staff and skills as part of the human factor in knowledge sharing in Subsubsection 8.3.3.1. We saw that there is not yet a structured appraisal process to reward employees neither for their knowledge sharing nor for their cooperative participation in teams. Leverage of one's skills is valued and abundantly facilitated. Job rotation is often hampered because people have a strong sense of belonging to their own department and because the expertise of specialists is deemed to be of less value in a different environment within the Ministry. No career paths exist for specialists who do not want to perform managerial activities. Initial steps have been taken to appoint personnel to encourage knowledge sharing.

Style

The Ministry realizes that example behavior of management is crucial. Back (2001) observes that "Knowledge workers demand a leadership style that steers on knowledge." This initiated several developments to enable management to act accordingly. Management development programs emphasize the desired behavior (the theme for the year 2001 is "coaching for and coaching by managers"). In competence profiles of managers extra attention is paid to people management skills, and specific workshops to accommodate this will be offered. The structural nature of this change in management style — i.e. steering on knowledge — is underlined because its effectuation in practice forms (since recently) part of the yearly appraisal process for managers.

This changed management style also bears down on employees. Ingen Housz (2000) reports that coaching should help to enhance the ability (i.e. knowledge, skills, competences, attitude, and personal characteristics) of the employee. In addition more organizational conditions are created through which management can shape an environment in which employees are able to work knowledge effective and environment focused.

Shared values

Ingen Housz (2000) recognizes that the different Directorates-General and the Government Buildings Agency have shared values of their own with which their employees associate themselves more than with a Ministry-wide culture. Back (2001) comments that knowledge in the — somewhat compartmentalized — Ministry still too often equals monopoly and power, and that the amount of collaboration ought to be improved. Therefore a Ministry-wide program has started to change the attitude of employees from monopolizing knowledge to distributing knowledge. By explicitly addressing the desired culture in this political biased organization, it is stimulated that people share their knowledge, learn from experiences, are open to change, accept their individual responsibility, and strive for flexibility (Back, 2001).

8.3.3.3 The technology factor

We described in Section 3.7 (on page 37) that information and communication technology can create an interconnected environment. Such an environment enables people to electronically communicate, collaborate, and to share knowledge: any-time, any-place. Quite some steps have been taken in this organization to realize an interconnected environment, in line with and to support the defined desired organizational culture. Some of these initiatives occur on a Ministry-wide scale, others originate in the Directorates-General.

When we apply the segmentation of information and communication technology functionalities that can support knowledge sharing as stated by Anderson and Smith (1998, see Subsection 3.7.2 on page 39 for an elaboration of this segmentation in: office applications, groupware, document systems, work process systems, analytical systems, and knowledge systems) to the Ministry and we consider the tools related to this segmentation (as described in Appendix C on page 215), we obtain the following image:

Office applications

E-mail and messaging systems

Organization-wide e-mail is — next to face-to-face meetings, (mobile) telephone, facsimile, and memorandums — used intensively within the Ministry.

Calendaring and scheduling

Some tools are used to maintain and monitor a to-do list, to record appointments, to give insight into the calendars of team members, to schedule meetings and subsequently to generate invitations for those meetings.

Personal productivity applications

A standard electronic workplace is equipped with an office automation suite for word processing, spreadsheet calculations, and for creation of presentations.

Groupware

Same time - different place

Electronic meeting system

The ministry employs an intensely used group decision room. A specifically assigned employee act as a moderator for all sessions to maximize the result.

Same time - different place

Chat systems; application sharing systems; shared whiteboards; collaborative virtual environments; video conferencing systems

A video conferencing system is installed, but people are not in the habit of using it.

The Ministry implemented an innovative collaborative virtual environment: "the intranet hotel." This intranet hotel may even be classified as an electronic project room (that supports different time - same place collaboration). Unfortunately, people are not aware of this facility or are not supported to utilize it.

Different time - different place

Electronic discussion systems; co-authoring systems

Discussion systems exist as part of the intranet environments, however usage is seldom on a useful level.

Document systems

Integrated document management

A document management system is used within the Ministry to control and manage the flow of correspondence. Specific plans exist to replace this system with a state-of-the-art integrated document management system.

Document imaging

A limited amount of scanning takes place at the moment. This will probably change when the integrated document management system is implemented.

Work Process systems

Work management systems

The integrated document management system that is to be implemented will also function as a workflow management system.

Knowledge systems

Information and knowledge retrieval

Internet

Most of the employees have (an often rather slow) access to the Internet through the network of the Ministry.

Intranet

Several intranets exist. There is a Ministry-wide intranet and others are in use in the different departments. Not all intranets are connected yet and there is a difference in the level of development.

Efforts are taken to upgrade the functionality and to make the Ministry-wide intranet part of the daily operations of people (at this moment for example the much used phone directory is not accessible via the intranet) to stimulate a better usage of the intranet.

Library

The Ministry employs a professional internal library. Usage however, seems not high, therefore plans are carried out to make the catalogue electronically available.

Online learning

Back (2001) reports on an investigation on learning methods (in what way do employees acquire and use knowledge) to find out methods and techniques that may facilitate transfer and distribution of knowledge.

Knowledge management

Knowledge databases and repositories

Several knowledge databases and repositories exist in the Ministry: they contain for instance jurisprudence and human resource affairs. A central database is to be constructed to register all ongoing research. We also refer here to the intention of implementing an integrated document management system.

Knowledge routemaps and directories

A yellow pages service or skill inventory system is in operation. This 'kenniswijzer' (knowledge pointer in Dutch) stores phone number, room number, department, e-mail address, position, the projects a person is currently working on or was involved with, communities, experience, expertise, skills, interests, affiliation, and publications of people in the Ministry. A project will be started to ensure this system will become an integral part of the way of working.

At this moment a system is employed that gives an overview of all (non-electronic) databases, but it does not offer (hyper-) links to electronic documents.

Knowledge networks and discussions

We defined this category in Appendix C (on page 215) to focus on tacit knowledge: it provides opportunities for electronic interaction between people. The Ministry developed an advanced system in this category: the intranet hotel that can function as a collaborative virtual environment and as an electronic project room.

8.3.4 Assessment of existing conditions

To assess the fulfillment of the conditions existing in the Ministry of Housing, Spatial Planning, and the Environment we use our findings from the interviews, internal publications, and insight of the chairman of the Taskforce Knowledge Management of the Ministry. The assessments (with the representative value of a condition rated in the interval between 1 and 10, to indicate a *not present* up to a *completely fulfilled* condition) and their justification are given in Table 8.2 below.

	Condition	Value	Justification
Social	appraisal	**2**	Conscious and active rewarding of knowledge sharing is not a structural policy. People are more prized for their personal knowledge than for the sharing of this knowledge. Ideas exist to change this and to incorporate assessment of the level of knowledge sharing in the yearly appraisal process.

	Condition	Value	Justification
	care	**7**	The Ministry is a social, warm, and affectionate organization. Horizontal relationships are considered as friends, vertical relationships are generally regarded as task-oriented family. Attention is been paid to the well-being of people (for example by attractive terms of employment, a day care center, a fitness room almost free of charge, several staff associations, and special programs for new employees). Instruments such as coaching exist, but often suffer from pressure of daily work activities: attending a meeting is considered more profitable than coaching a colleague.
	competence leverage	**8**	There exist various possibilities for education and coaching. The Ministry defines educational programs, facilitates career planning, stimulates job rotation, and is working on a competence management system that includes personal development plans. At the moment educational activities are not always related to the current or future position of a person. This will improve through the realization of the competence management system, which will become applicable to all employees. The skill inventory system 'kenniswijzer' (that we described in Subsubsection 8.3.3.3 on page 141) on the company-wide intranet has yet to become an integral part of the way of working in the Ministry. Extended career paths are not existent for experts and specialists: the career paths dominantly follow a managerial route.
	empowerment	**5**	Employees enjoy a great deal of liberty in organizing their work but do not have this formalized. The hierarchical structure present can be characterized as a 'culture of initials': policy statements have to be formally approved by every link along the hierarchical line.
	knowledge crew	**4**	Some FTE is allotted to stimulate knowledge sharing. A few departments employ information-brokers who point out interesting literature to colleagues, one Directorate-General employed a halftime coordinator knowledge effective working, and another Directorate-General will appoint competence-coaches who give guidance to personal development. The library acts as an intermediary for information and explicit knowledge.
	trust	**7**	There is a slight difference in the level of trust between the horizontal lines (very frequent face-to-face contacts between colleagues) and the vertical lines (hierarchical relations). Political and competitive motives (for instance between the Directorates-General) have a harmful impact and also career issues (between persons) have a negative influence on this condition.
Organizational	climate of openness	**5**	The openness is fine in bilateral contacts but in meetings the level of openness is limited. Criticism is generally experienced as threatening and therefore a perceived truth is not overtly given.
	collaboration	**4**	The way of working within the Ministry caters for a restricted amount of collaboration. Projects do not come with a felt shared responsibility (often no replacement is arranged when a person is absent) and people are not rewarded for results achieved by shared efforts.

	Condition	Value	Justification
	community	**4**	A couple of rather diverse communities exist, for example around starting employees, women at the top, music lovers, and fitness. The importance of communities is realized, but no specific policies exist to stimulate their existence.
	dialogue	**5**	In social interaction people are open to ideas of others, but — perhaps influenced by the political environment — there tends to be more discussion than dialogue. Sessions are organized to talk and brainstorm about specific subjects that are of interest to the (people of the) organization. These sessions have a decent attendance. An internal course ("implementation challenge") exists that trains people in looking at situations from multiple perspectives.
	knowledge champion	**1**	At this moment no member of topmanagement of the Ministry is actively promoting knowledge sharing.
	learning organization	**3**	There is a rather limited usage of stored knowledge (people tend to visit the well-stocked library rather seldom). No comprehensive survey of research (completed, under way, and planned) is available. Concluded projects are not systematically evaluated. Lessons learned are not recorded or disseminated and therefore no organized learning from experiences takes place. Besides, it is not clearly and uniform registered which knowledge is needed in the execution of the daily workprocesses (now and in the future). The Ministry is conditioned to avoid mistakes at all costs, which does not help the climate for learning. On the other hand, policy and strategy (that can be related to double loop learning) get — in general — much more attention than realization and control (which can be linked to single loop learning).
	metric	**2**	No 'Return on Knowledge' is clearly been measured, neither in quantity nor in quality. The library keeps some statistics, and some local intranets measure their usage.
	organically structured organization	**3**	The Ministry has a formal, hierarchical structure with an emphasis on the distinctiveness of the Directorates-General and their departments. There is a tendency however to engage in process and project oriented working, to be able to cope better with developments in the environment.
	slack	**3**	There is no officially allotted percentage of working time to be spend on matters like reflection. Of course, the educational efforts consume a quantity of the available working time. The issues of the day create a (maybe sometimes perceived) feeling of time-pressure that interferes with knowledge sharing efforts, which is accepted as standard practice.
	system integrated into daily workprocess	**2**	Many systems are used in the Ministry but only a few are linked. Plans exist to expand the limited functionality of the corporate intranet (Vera) so that this system may serve as an Enterprise Knowledge Portal and will support and become part of the day-to-day business processes.

	Condition	Value	Justification
Technological	collaborative platform	5	Some information and communication technology tools exist that support collaboration. Company wide e-mail and the group decision room are heavily been utilized. The discussion forum on the corporate intranet is moderately used. The videoconferencing facility is seldom operated. We already mentioned in Subsubsection 8.3.3.3 "the intranet hotel" as an example of an innovative collaborative virtual environment that supports collaboration in project teams. Although usage of this facility is low, it shows that the Ministry values developments that offer such functionality.
	knowledge repository	3	In Subsubsection 8.3.3.3 we explained that several — sometimes not connected — intranets exist within the Ministry. The internal network offers access to the Internet. Some knowledge databases and repositories exist on special topics. Plans are made to build a database to register all ongoing research and to implement an integrated document management system.
	knowledge routemap	3	The 'kenniswijzer' or skill inventory system that we described in Subsubsection 8.3.3.3 is operational but not yet of practical use (a relatively low percentage of the employees is participating and most people do not maintain their data). Electronic dissemination of research (completed, under way, and planned) is unavailable, neither is it possible to make use of the services of the library (catalogue, articles, reports) in an electronic way. A collection of (newspaper) clippings is electronically available and plans exist to electronically distribute (contents or abstracts of) magazines and articles.

Table 8.2: Assessment of conditions existing in the Ministry

In Figure 8.2 below we graphically present this table: the social conditions are fairly fulfilled, just like the organizational conditions, but the technological conditions have low values.

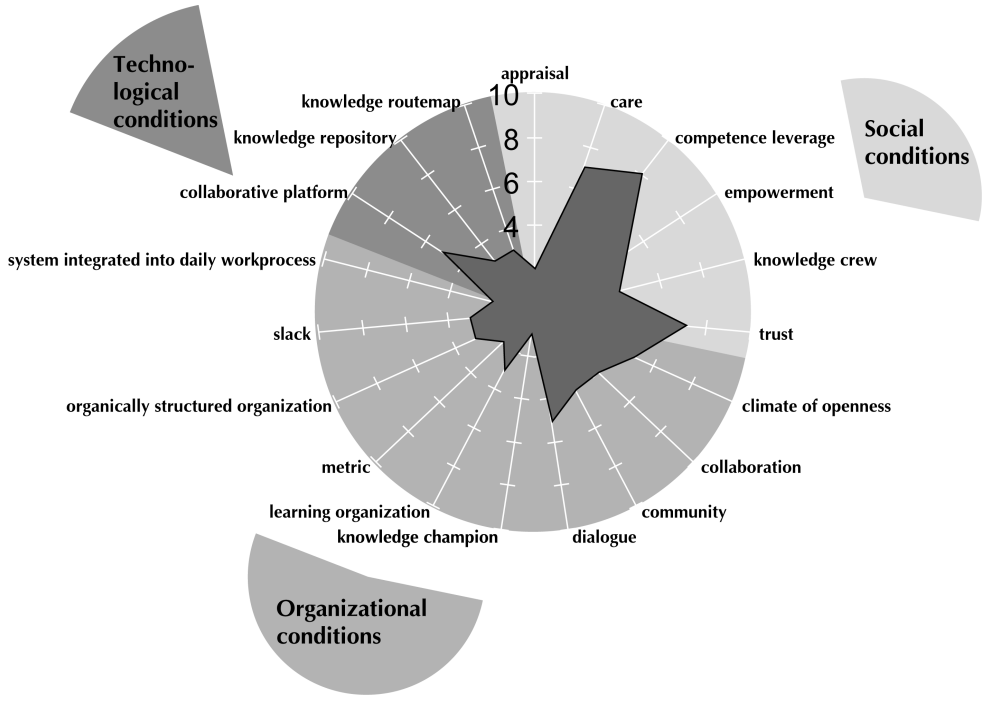


Figure 8.2: Assessed conditions in the Ministry

8.3.5 The applicable knowledge sharing phase

We reason that the Ministry of Housing, Spatial Planning, and the Environment operates under a codification strategy because their products and services are fairly mature. Their products and services do not vary much except for adaptation to changed circumstances in society, which we consider relatively steady.

The next step of our repeating process of assessment and action (that we presented in Section 7.7 on page 123) uses the values that result from the assessment of the enabling conditions (as denoted in Table 8.2 above) to enable us to derive an indication of the level of knowledge sharing in the Ministry (as defined in Appendix D on page 227). Using Table D.1 (on page 232) this indication helps us to determine the knowledge sharing phase that is applicable to the Ministry. We conclude that the *unawareness phase* denotes the level of development with respect to knowledge sharing in the Ministry.

8.3.6 Selection of conditions most appropriate to stimulate

In Subsection 8.3.5 (on page 147) we stated that the unawareness phase is applicable to the Ministry. In the introduction of Section 8.3 (on page 136) we wrote that this organization was selected as a case study for its interest in knowledge sharing. Consequently, we assume that the Ministry is striving to encourage knowledge sharing and we therefore induce a transition from this unawareness phase to the next phase: the knowledge repository phase. The conditions that we select to stimulate are therefore related to the knowledge repository phase (see Table 6.3 on page 111): appraisal, competence leverage, slack, system integrated into daily workprocess, and knowledge repository.

8.3.7 Observation and analysis

8.3.7.1 Current situation

Based on the findings from our in-depth interviews in the Ministry we found the following — knowledge sharing related — issues of consideration as the most relevant: segmentalist behavior, effectuation of internal policies and strategies, process execution, relevance of knowledge sharing, and availability of information. These issues are illustrated below.

- The Ministry of Housing, Spatial Planning, and the Environment is a politically managed organization. Politics will therefore influence decision making and will occasionally interfere with open communication, and sharing of information and knowledge. Politics also enhance a certain amount of segmentalist behavior. (Such behavior is also reflected in the knowledge infrastructure, there exist for example several — sometimes unlinked — local intranets).
- Managerial attention between the definition of internal, organizational policies and strategies (which seems to be the main focus) and the realization, implementation, operation, and control of these policies appears not in equal balance. Effective, consistent effectuation of these policies and strategies will lead to tangible results, will reduce waste of efforts already undertaken, will help to enforce standards and guidelines, and will result in a more consistent, integrated, and collective (knowledge) infrastructure.

- Establishing uniform process execution guidelines (for example in project management or problem solving, which is not present or not abided at the moment) and the discipline to apply this, will enable to institute best practices and may impose the recording (and usage) of lessons learned.
- Topmanagement should agree on the relevance and benefits of knowledge sharing for the Ministry. This may cause a crucial change from taking nearly unconscious steps to steering — with concrete measures — on an organization-wide scale in order to realize the needed change in the way of working. The activities and measurements involved with this steering will send a clear and unambiguous signal to the organization about desired behavior.
- The way of working may be helped by increasing the availability of information and knowledge needed to perform the daily routine in a way and format as desired. It looks as if people at the moment only use a limited number of information and knowledge sources when compared to the sources available. Improved availability of information and knowledge, combined with the frequent personal contacts — that enable effective transfer of information and knowledge — may lead to improved decision-making.

8.3.7.2 Influencing developments

We discerned from our interviews the following trends that may become relevant to the Ministry: contracting out research, personal development, covenants, and integral approach. These trends hold an indication for a direction in which possible improvements to the above mentioned issues should fit.

- From carrying out research to contracting out research (as nowadays practically no research is carried out anymore within the Ministry, this trend has materialized).
- Satisfying the increasing need for personal development of people, to better attract and retain employees (and their knowledge). Coping with employees who are more self-conscious.
- From issuing decrees to agreeing on covenants (from enforcement to collaboration).
- From a segmentalist approach to an integral approach (from your own shop to collective responsibility), — internally as well as externally — due to an increasing complexity of society. Policy making will involve cooperation with more parties (other Ministries, public bodies, organizations, and interest groups) than it used to. Soloist actions do not solve problems like for instance air pollution anymore.

8.3.7.3 Directions for improvement

When we correlate the issues of consideration (as mentioned in Subsubsection 8.3.7.1) with the possible trends (as described in Subsubsection 8.3.7.2) we can distinguish the following — knowledge sharing related — opportunities for improvement (see Table 8.3 below).

	Contract out research	Stimulate personal development	Arrange covenants	Enforce integral approach
Reduce segmentalist behavior	• combine purchase efforts (to decrease costs); • attune and prioritize research needs on a periodical basis	• encourage job rotation throughout the Ministry; • have problems solved by heterogeneous (cross-functional) teams and reward the team members (who have different hierarchical levels) in a way visible for the whole organization; • organize joined (long-term) trainings with participation by employees from distinct organizational units (perhaps selected on characteristics like age, gender, education, or position); • stimulate exchange of employees with affiliated organizations	• define a number of flexible ways to organize (and formalize) cooperation with affiliated organizations; • discontinue efforts to develop and maintain local intranets; • install employee pools that brings together staff (often with a special expertise) that can be employed Ministry-wide irrespective of their organizational unit	• realize an organizational structure based on knowledge domains (areas of discourse that are of interest to the Ministry); • increase cooperative behavior between organizational units through combined projects, committees, study groups etc in which participants hold a shared responsibility; • stimulate and facilitate brainstorm sessions, discussion sessions, and project progress meetings
Improve implementation and control	• change the relationships from a patron - executor type to a partnership form; • introduce (as part of the contracting process) a step to make the research question explicit and clear for all parties involved	• increase recognition for jobs related to implementation, operation, maintenance, and control; • stimulate broad employability of people	• evaluate yearly the practical outcomes of defined internal, organizational policies and strategies; • define and assign responsibilities to selected employees (make them *owner*) and hold these people accountable for the performance of their system; • allocate the necessary budget (in capacity and funding) for realization, implementation, operation, maintenance, and control	• define and enforce infrastructure standards; • tune the characteristics of the knowledge routemap 'kenniswijzer' to related developments (like RYX, the knowledge routemap project of the combined government); • promote and stimulate the usage of the collaborative virtual environment: "the intranet hotel"
Improve process execution	• create a workflow management system to facilitate the process of contracting out research; • let a neutral person check whether the research question fits in the overall policy of the Ministry; • investigate which (ICT-) activities can be done better or cheaper by an external organization; • define yardsticks to assess progress and measure periodically	• enhance empowerment: and increase the responsibilities of the employees; • consider cyclic rotation in the management of an organizational unit and in project teams; • facilitate trainings for improvement of dialogue, discussion, and discourse skills; • supply instruments to support thinking and reflection	• record and distribute best practices; • make participation in project groups at least as attractive as carrying out one's regular job (with respect to recognition, career opportunities, and raise of salary); • locate members of project teams close to each other (this has the extra advantage that members are separated from their own hierarchical environment); • audit with all parties involved the (quality and timeliness of the) process and the result, write these lessons learned down and distribute them	• define a standard project management system; • define a uniform problem solving method; • let topmanagement enforce usage of these guidelines and let them create ample time for employees to use these standards; • make the use of the knowledge routemap 'kenniswijzer' (that registers the skills of a person) obligatory when assembling project teams; • assemble project teams also using the competence management system (use the registered competencies to conduct a Belbin-test to select the necessary roles)

	Contract out research	Stimulate personal development	Arrange covenants	Enforce integral approach
Effectuate knowledge sharing	• improve distribution of concluded research and analysis; • arrange periodical meetings in which results are explained and discussed with colleagues	• create career paths for specialists who do not want to perform managerial activities; • define which skills, competencies, and knowledge will be needed by the organization in the near future; • institute a competence management program that includes personal development plans that focus on both competency and skills; • define and introduce a compensation and reward scheme (in more autonomy, more resources, virtual credits, attractive assignments, boosting someone's ego, time, position, or money) for contributing knowledge to the organization and for using knowledge from the organization and incorporate this in the annual performance appraisal process: this scheme should not only reward individual performance but collective improvement as well; • define measures to capture knowledge contributions and monitor a persons' individual development and contributions; • appoint employees specifically in charge for (encouragement of) knowledge creation and sharing across organizational boundaries (perhaps for a certain area of know-how or expertise); • make more use of students and trainees; • create slack time for employees so they are able to reflect, start and/or participate in dialogues; • make specialists and experts more visible and offer easy access to them; • offer simple access to specialists and experts from outside the Ministry	• record and distribute lessons learned; • set up communities of practice and/or interest groups (also with people from other organizations); • organize frequently knowledge markets, lectures etc and reward the people who organize and actively participate in these events; • stimulate publications and have people report on their attended courses and visits to seminars, congresses etc; • institute mentorship and coaching; • seek active contact with customers, stakeholders, and affiliated organizations; • keep in contact with employees who resigned from the Ministry (to broaden the network and to learn from their experiences); • critically evaluate in the selection process of new employees their motivation and ability to share knowledge; • hire employees that have the skills, competencies, and knowledge as needed by the organization; • make unambiguous appointments about knowledge transfer when hiring external experts; • have the employees jointly develop a new code of conduct in relation to knowledge sharing	• create a communication program to proclaim the new way of working; • appoint an involved top manager as the knowledge champion; • have topmanagement actualize conditions that enable knowledge sharing; • let topmanagement demonstrate example behavior (train them to do so) and evaluate them on this; • reward people who show the desired behavior in a visible way; • stimulate intensive collaboration with affiliated organizations like research institutes, universities, other ministries, public bodies, and interest groups; • identify the business processes and activities that create or share knowledge; • create expertise centers under supervision of competency knowledge managers

	Contract out research	Stimulate personal development	Arrange covenants	Enforce integral approach
Improve availability of information	• give insight (on a continuous basis) what research has been done, what is underway, and which initiatives or plans for new research do exist • install a standardized reporting system to monitor (and compare) the status of research that is underway	• investigate the existing and anticipated information needs, adapt the services of the responsible organizational unit accordingly, and stimulate usage of these improved services; • offer access to the company-wide intranet, irrespective of the location of the user; • digitize the information flows: implement for example a personal, automated archive system or scan the incoming mail; • improve the speed of Internet access from the desktop; • introduce online learning; • appoint (for each knowledge domain) information brokers specifically in charge for searching, collecting, and distributing knowledge; • introduce automatic push of stored information and knowledge; • create possibilities for employees to subscribe to or show interests in certain subjects; • investigate periodically whether it is easy to find the desired content and determine the level of its accurateness	• attune information and knowledge needs and their gathering (where are knowledge gaps and who will fill them in), creation, and distribution with affiliated organizations; • define who is responsible to pick up signals (which?) from society with respect to developments that may lead to new policies, and with whom these signals should be discussed	• realize a full-fledged company-wide intranet with respect to functionality and operation, maintenance, and control; • make this intranet the 'enterprise knowledge portal': *th*e starting point for online activities; • introduce more information and explicit knowledge components online (like articles, project evaluations, work procedures, reports, tenders, manuals, relevant developments, and databases) from within and from outside the Ministry and index these knowledge components for easy retrieval; • introduce more pointers to knowledge components online (like lessons learned, methods, and best practices); • structure explicit knowledge according to the thesaurus of the Ministry; • add meta-data to the explicit knowledge (like a status, whether the knowledge is company-policy, the degree of accuracy or trustworthiness, who the content-owner is, and so on); • define guidelines for adding information to the intranet; • keep the content of the intranet up-to-date (supply 'magnet content' in order for users to keep coming back); • help employees in tracking down valuable content on the Internet; • create an infrastructure to exchange information and knowledge with affiliated organizations; • implement an integrated document management system (with workflow management support); • reduce the dependence on individuals with respect to the use of their knowledge (for example: introduce a buddy system)

Table 8.3: Issues of consideration correlated with possible trends

8.3.8 Proposed stimulations of conditions involved

When we take into account the justification of the assessment of the fulfillment of the enabling conditions (as described in Subsection 8.3.4 on page 143), the codification strategy that the Ministry operates under (as noted in Subsection 8.3.5 on page 147), the conditions selected to become stimulated (as listed in Subsection 8.3.6 on page 147), and our analysis of the Ministry, Table 7.2, and Table 8.3 (on page 123 and 151 respectively), we put forward the following possible stimulations of the selected conditions:

Appraisal

- Appraisal can be implemented by defining and introducing a compensation and reward scheme (in more autonomy, more resources, virtual credits ('knowledge miles'), attractive assignments, boosting someone's ego, time, position, or money) for contributing knowledge to the organization and for using knowledge from the organization. Incorporate this in the annual performance appraisal and evaluation process. This scheme needs to "motivate employees to continually increase their own capabilities and share knowledge" (Mohrman and Finegold, 2000). The compensation and reward system should focus on the kinds of behavior organizations want to promote: for example stimulating open dialogue and mutual exploration across sub-culture boundaries (Schein, 1996a).
- This scheme should not only recognize and reward individual performance but collective improvement as well (O'Dell and Jackson Grayson, 1997), because "Cultures that primarily reward individual creativity and innovation have different patterns of interaction around knowledge than cultures where uncovering and leveraging existing expertise — from almost any source — is the norm" (Long, 1997).
- Make participation in project groups at least as attractive as carrying out one's regular job (with respect to recognition, career opportunities, and raise of salary).
- Let topmanagement demonstrate example behavior (train them to do so) and evaluate them on this.

Competence leverage

Although the current value of competence leverage is already quite formidable (8), abundant possibilities exist to stimulate this condition even more. We group these possibilities according to their nature: competence management, learning facilities, knowledge sources, supporting structures, and career incentives.

Competence management

- Define which skills, competencies, and knowledge the Ministry will need in the near future and have this reflected in the competence management program that will include personal development plans.
- Institute personal development plans with individual learning targets to help employees develop at each career level and across organizational boundaries. "Instead of just having employees' targets tied directly with a business unit's performance, such as sales or quality control, an organization can start requiring employees to target what their knowledge acquisition will be in the next period. Will they team a new skill, understand a process they currently do not, improve the design of a computerized report, or extensively study a competitor, channel or product?" (Bontis, 1996).
- Define "two sets of responsibilities for the individual, each of which should grow proportionally: the responsibility to acquire expertise; and the responsibility to make your help accessible to those who need it as your expertise grows" (Krogh, 1998)

and incorporate this into the human resource development practice (and appraisal system).
- Define measures to capture knowledge contributions and monitor a persons' individual development and contributions. Also define measures to capture team developments.
- Introduce a system in which the competences and skills of every employee can be registered and that can track individual and team development. This system has an easy access for viewing, changing and deleting (corresponding to the authorization levels enforced).

Learning facilities
- Offer access to Computer Based Trainings, accessible (through Internet) direct at the educational institute or at the company's own intranet.
- Facilitate trainings for improvement of dialogue, discussion, and discourse skills. Stimulate and facilitate brainstorm sessions, discussion sessions, and project progress meetings for knowledge transfer of attended courses and seminars and of lessons learned.
- Install mentorship and coaching, shadow-consulting and counseling, and introduce a buddy system for new personnel.
- Have problems solved by heterogeneous (cross-functional) teams and reward the team members (who probably have different hierarchical levels) in a way visible for the whole organization.
- Encourage job rotation throughout the Ministry (stimulate broad employability of people) and stimulate exchange of employees with affiliated organizations.
- Consider cyclic rotation in the management of an organizational unit and in project teams.
- Stimulate publications and have people report on their attended courses and visits to seminars, congresses etc.
- Institute "project debriefings and other forms of learning-oriented conversations that have sharing experience among project participants and enhancing the personal learning of each individual as the chief goals. After closing an innovation project, sufficient time is too seldom allocated to briefings and too little care devoted to helping each individual to get the most learning benefit out of the project. Good project briefings cover a review of the project goals and whether they were met, the individuals' experiences with working relationships, the key lessons learned by the individuals and by the team as a whole, the new methods and tools resulting from the project, the quality of the leadership exercised, as well as the knowledge and best practices to be transferred to other teams" (Krogh, 1998).
- Supply instruments to support thinking and reflection.

Knowledge sources
- Make specialists and experts (also from outside the Ministry) more visible and offer easy access to them.
- Offer trainee posts for graduates (Weggeman, 2000), for they recently have been infused with state-of-the-art knowledge.
- Install procedures to secure knowledge transfer from hired consultants, external experts, or from partner organizations.

Supporting structures
- Appoint employees specifically in charge for (encouragement of) knowledge creation and sharing across organizational boundaries (perhaps for a certain area of know-how or expertise).

- Organize knowledge fairs. Gray (2001) defines these as follows: "Knowledge fairs are like internal trade shows that are produced by employees for employees. They are relatively unstructured gatherings where employees staff booths, mount displays, and talk about their firm's successful practices and products. Knowledge fairs encourage the spontaneous exchange of knowledge between employees who never get to talk to one another in the course of their daily work. Knowledge fairs bring people together without preconceptions about who should talk to whom, giving people opportunities to wander, mingle, and talk."
- Set up a number of talk rooms, these are (Gray, 2001): "social spaces which R&D staff are expected to visit for 20 minutes or so as a normal part of their workday. Meetings are not held here, and there are no organized discussions. The expectation is that the researchers will go to these talk rooms and chat about their current work with whomever they find, and that these more or less random conversations will create value for the firm."
- Establish departments that function as knowledge-centers, centers of expertise (or competence centers), or bureaus of lessons learned (Weggeman, 2000).
- Allow employees to attend meetings in other departments, project groups, or committees. Create electronic access to agenda and minutes of meetings.

Career incentives

- Create career paths for specialists who do not want to perform managerial activities.
- Increase recognition for jobs related to implementation, operation, maintenance, and control.
- Enhance empowerment: this increases the responsibilities of the employees and it democratizes the information flows.
- Critically evaluate in the selection process of new employees their motivation and ability to share knowledge and whether they have the skills, competencies, and knowledge as needed by the organization.

Slack

- Allocate to employees a percentage of their time to spend on learning, reflection, dialogues, and sharing activities they chose themselves. Relate this percentage to the seniority of the employee (because senior employees are considered to be more autonomous and less susceptible to irrelevant distractions).
- Consider to set periods of the workday aside specifically for learning and sharing.
- Offer employees resources to cope with the demands on their time. An organization can reduce demands, prioritize demands, focus only on a few critical activities, and reengineer or simplify work processes (Ulrich, 1998).
- Introduce a directive that allows an employee to take a sabbatical year after for example five years of service.

System integrated into daily workprocess

- Systems can be integrated into daily workprocesses by understanding the daily behavior of employees. Expand existing systems accordingly or introduce systems that seamlessly work together with already existing systems and technology choices so that they support this daily behavior.
- Allocate the necessary budget (in capacity and funding) for realization, implementation, operation, maintenance, and control of systems.
- Evaluate yearly the practical outcomes of defined internal organizational policies and strategies with respect to systems.
- Define and assign responsibilities to employees (make them owner of a system) and hold these people accountable for the performance and usage of their system.

- Define infrastructure standards, a standard project management system, and a uniform problem solving method. Let topmanagement enforce usage of these standards and guidelines and let them create time for people to do so.
- Create the infrastructure to easily exchange data, information, knowledge, and (research) models with affiliated organizations.
- Realize a workflow management system to facilitate the process of contracting out research.
- Implement an integrated document management system (with workflow management support).

Knowledge repository

We divide the possible stimulations of this condition into three groups: information needs, organization wide intranet, and access and distribution.

Information needs

- Investigate the existing and anticipated information needs, adapt the services of the responsible organizational unit accordingly, and stimulate usage of these improved services.
- Appoint (for each knowledge domain) information brokers specifically in charge for searching, collecting, and distributing information and knowledge.
- Help employees in tracking down valuable content on the Internet (and on the organization wide intranet).
- Investigate periodically whether it is easy to find the desired content and determine the level of its accurateness.
- Attune information and knowledge needs and their gathering (where are knowledge gaps and who will fill them in), creation, and distribution with affiliated organizations.

Organization wide intranet

- Install an organization wide intranet — the 'enterprise knowledge portal' — containing digitally stored documents that contain articles, project documentation and evaluations, presentations, work processes and procedures, reports, tenders, manuals, new developments, databases, methods, and testaments of employees who left the company, or customer related information. Use web browsers or search engines (perhaps with full-text search) to access these documents. The classified and catalogued contents — from within and from outside the Ministry — must have a dependable quality and should be of value to the user (i.e. they should offer magnet content). In addition information maps, digital intelligent search-agents, or knowledge wizards can be implemented to aid in the navigational and retrieval process. Ensure adequate resources are available for operation, maintenance, and control.
- Discontinue efforts to develop and maintain local intranets.
- Define guidelines for adding information and knowledge into the intranet.
- Buy systems that automatically capture content rather than that people are required to enter it into the system (Elliott, 1997a).
- Add meta-data to the explicit knowledge (like a status, whether the knowledge is company-policy, the degree of accuracy or trustworthiness, who the content-owner is, and so on) and maintain this.
- Investigate which (ICT-) activities can be done better or cheaper by an external organization.

Access and distribution

- Make an inventory of who possesses which knowledge and store this on the company-wide intranet.

- Offer reliable and fast access to the company-wide intranet, irrespective of the location of the user.
- Create possibilities for employees to subscribe to or show interests in certain subjects.
- Introduce automatic push of stored information and knowledge.
- Improve distribution of concluded research and analysis.
- Install a standardized reporting system to monitor (and evaluate) the status of research that is underway.
- Give insight (on a continuous basis) what research has been done, what is underway, and which initiatives or plans for new research do exist.
- Arrange periodical meetings in which research results are explained and discussed with colleagues.
- Improve the speed of Internet access from the desktop.
- Digitize the information flows: implement for example a personal, automated archive system or scan the incoming mail.
- Merge the contents of knowledge repositories with external knowledge bases and create multiple tables of contents (Vogel, 1996).

8.3.9 Suggested approach and result

The people we spoke in our interviews showed a distinct awareness about the opportunities that knowledge sharing has to offer. An approach is needed in which these opportunities are substantiated. Our analysis of the situation with respect to knowledge sharing in the Ministry resulted in possible stimulations of a number of relevant enabling conditions, as presented in Subsection 8.3.8 (on page 152). We first discussed the outcome of our analysis with the chairman of the Taskforce Knowledge Management. We invited the interviewees for a group decision room session of a half-day to evaluate and discuss the results of our study. Regrettably only a small number of interviewees promised to attend this meeting, therefore we send the results of our study as a written report to the interviewees.

Looking back, perhaps we better had accompanied our invitation to the group decision room session with a very short, concise summary of our analysis. We also would have added the following stimulations that we consider, on a perceived effort versus return comparison, as the stimulations with the strongest value proposition for the Ministry:

1. Install an organization wide intranet — the 'enterprise knowledge portal'.
2. Investigate the existing and anticipated information needs and adapt the services of the responsible organizational unit accordingly.
3. Define which skills, competencies, and knowledge the Ministry will need in the near future and have this reflected in the competence management program.
4. Institute personal development plans with individual learning targets.
5. Encourage job rotation throughout the Ministry and stimulate exchange of employees with affiliated organizations.
6. Appoint employees specifically in charge for knowledge creation and sharing across organizational boundaries.
7. Organize knowledge fairs.
8. Install procedures to secure knowledge transfer from hired consultants, external experts, or from partner organizations.
9. Facilitate trainings for improvement of dialogue, discussion, and discourse skills.

At the same time it became clear that topmanagement of the Ministry did not want to spend too much capacity and budget in knowledge sharing activities. Actually, the chairman of the Taskforce Knowledge Management is organizationally restricted in the amount of time he can spend on knowledge sharing. This may suggest that management perceives knowledge sharing as another fad and does not want to invest in this. In spite of the fact that many concrete activities are now identified that will have a positive effect on knowledge sharing, the lack of a management 'buy-in' creates a slowdown in — already undertaken and new — efforts to encourage knowledge sharing.

The chairman of the Taskforce Knowledge Management identifies the following reasons why the management 'buy-in' may be absent:

- Knowledge management is a vague concept that does not appeal to management, there are many other problems that demand attention.
- Topmanagement foregoes the knowledge sharing issues for middle management to deal with it.
- Knowledge sharing may hold a possible threat to the position of (middle) managers and that does not encourage them to cooperate.
- Management does not have a good idea how to deal with knowledge management.
- Knowledge management has also to do with cultural aspects and the attitude of employees: difficult, difficult, and difficult.
- Management is familiar with the present situation and that may change with knowledge sharing, which may imply embarking on an insecure adventure.
- Nobody can clarify the tangible revenues of knowledge sharing.
- People have to invest time in this, on top of their daily operations, and for what?
- Management then also has to steer on knowledge sharing: another extra burden.
- There is no sense of urgency, no doubt action will be taken in case of immediate disasters, but at the moment everything continues the way it is.
- People prefer to keep things they way they are, they are not keen on changes.

8.4 Case Unilever Research & Development Vlaardingen

We introduce the case study Unilever Research & Development Vlaardingen (the Netherlands) in this section. We selected this research organization for their focus on knowledge and knowledge sharing and their need to connect people on a worldwide scale.

Unilever is one of the principal companies in the world that produces consumer goods for daily use, such as foods and products for home and personal care. Unilever Research & Development Vlaardingen is one of Unilever's central research laboratories. Unilever Research & Development Vlaardingen is of a dissimilar organizational character and deploys different organizational processes than the case studies we reported on earlier (Getronics Consulting, Royal Netherlands Air Force, and the Ministry of Housing, Spatial Planning, and the Environment).

Analogue to the case study of the Ministry we collected the data presented in this section through interviews with employees from Unilever Research & Development Vlaardingen, observations, internal publications, documents, reports, web-sites, and archives. The larger part of the selected interviewees are professionally engaged in knowledge and information management, the other interviewees are line managers. An introductionary e-mail was sent

to the selected employees that clarified the purpose of the interviews, emphasized the perceived importance of this project, and petitioned the interviewees for their support. This e-mail also included a short explanation of our method, the project plan that described the activities to be undertaken, and the curriculum vitae of the researcher.

The main goal of the interviews is — just like the case study of the Ministry — to assess the fulfillment of the 19 identified enabling conditions and to justify that assessment. The interviews in Unilever Research & Development Vlaardingen were held from August until October 2001 and they lasted on average about 1,5 hour. One person (with a working history of almost 35 years within this organization and a pioneer in the field of knowledge management) was interviewed twice. In total 18 interviews were conducted by the researcher who took notes during the interview and who transcribed these notes shortly after the interview.

8.4.1 Description

Unilever was formed in 1930 through the merger of the operations of the Dutch margarine company Margarine Unie and the British soap maker Lever Brothers. Nowadays Unilever is one of the largest consumer goods businesses in the world. In 2000 Unilever employed an average of 295,000 people in almost 100 countries and attained a turnover of more than € 47.5 billion. Its food and home and personal care brands are on sale in over 150 countries. Unilever spent in 2000 13.8% of its turnover on marketing and 2.5% (or € 1.2 billion) on research and development.

Unilever has an extensive range of well-known consumer brands on a global, regional, and local scale. *Lipton* tea and *Dove* soap are among the world leaders. Others brands with a distinctive consumer appeal are: *Knorr*, *Becel*, *Magnum*, *Ben & Jerry's*, *Carte d'Or*, *Iglo-Ola*, *Bertolli*, *Calvé*, *Conimex*, *Hellmann's*, *Ragú*, *Rama*, *Slim•Fast*, *Lux*, *Omo*, *Robijn*, *Calvin Klein*, *Karl Lagerfeld*, *Cerruti*, *Chloé*, *Organics*, *Sunsilk*, *Comfort*, *Pond's*, *Snuggle*, *Sunlight*, *Mentadent*, *Vaseline*, *Wisk*, and *Cif*.

The Corporate Purpose of Unilever is to meet the everyday needs of people everywhere — to anticipate the aspirations of its customers and to respond creatively and competitively with branded products and services that raise the quality of life. Fulfillment of the corporate purpose is regarded to create long-term value for shareholders and employees. To realize this corporate purpose Unilever commits itself to high standards of performance and productivity, to working together effectively, and to a willingness to embrace new ideas and learn continuously. Unilever thereby pursues the highest standards of corporate behavior towards its employees, consumers, and the societies and world in which Unilever operates.

Innovation is crucial in the fast-moving consumer market. The responsibility for innovation lies primarily with the (almost seventy) *Regional Innovation Centers*, spread throughout the world. It is their task to develop an in-depth insight into the needs and wishes of the consumer, to gear the research and development program to these requirements, and to introduce the ensuing innovations rapidly into the market. The Regional Innovation Centers specialize in certain product categories such as ice cream, detergents, and skin care, which are allocated on a regional basis. The *Global Brand Centers* deal with worldwide issues around a certain brand. The *Global Technology Centers* are corporate expertise centers that deal with issues in manufacturing and supply chain technology. The underlying procedure

of knowledge acquisition and protection, up to and including the application of knowledge, is developed by Unilever Research & Development in *central research laboratories*. The central laboratories are spread across six research centers on three continents. They are situated in the Netherlands (Vlaardingen), England (Colworth and Port Sunlight), the United States (Edgewater), and India (Andheri and Bangalore). There is a smaller laboratory in China (Shanghai). In total, some 8,000 people are employed in Research & Development.

This case study focuses on the central laboratory in Vlaardingen (the Netherlands), which was established in 1956. More than 1,300 employees contribute to the key objective of Unilever Research & Development Vlaardingen: to deliver innovative products, processes, and services through the application of science and technology. Unilever Research & Development Vlaardingen employs two approaches: applied research and fundamental research.

- Applied research takes place in Global Technology Centers, in close cooperation with Regional Innovation Centers and Global Brand Centers. In this respect Vlaardingen concentrates on the following product categories:
  - Spreads & Cooking Products, such as margarine, (olive) oils, and fats;
  - Health & Wellness, for example health enhancing products (functional foods);
  - Savoury, concentrates on culinary products;
  - Laundry, for instance laundry detergents.
- Fundamental research is done — frequently in cooperation with universities and scientific institutes — for all foods categories and laundry detergents. Vlaardingen focuses on the following science areas:
  - Consumer Science;
  - Measurement Science (microscopy, mass-spectroscopy, image analyses, and NMR);
  - Knowledge & Information Science (information science, data management, computer science, and computer support);
  - Food Processing & New Technology;
  - Taste & Flavor;
  - Product Microstructure;
  - Cereal Solutions;
  - Biotechnology (microbe and enzyme science);
  - Nutrition;
  - Fat & Oil Product Technology;
  - Laundry Research (ingredient science, product structure, and washing systems).

Vlaardingen is the home of the Unilever Health Institute, which studies the health effects of foods and drinks. In Vlaardingen is also a center of manufacturing expertise located, providing strategic support to Unilever factories and capital productivity programs. Manufacturing research in Vlaardingen developed many proprietary machines for margarine, ice cream, and other products.

8.4.2 Way of working

The Director of Laboratory of Unilever Research & Development Vlaardingen characterizes sustainable development as the guiding principle for the way of working (Unilever, 1999): “Sustainable development is the ‘marriage made in heaven’ between economic growth,

environmental protection, and social progress, and is of great importance to the twenty-first century. In the year 2025, the world population has grown by two billion, totaling eight billion people. To feed all these mouths, global food production will have to rise by a factor of four to five in the year 2025. In the longer term, people throughout the world will enjoy a reasonable level of prosperity; in combination with the increase in food production, this will impose an enormous burden on the environment. To assure food and prosperity without exhausting natural resources and the environment, sustainable development is the key."

This guiding principle of sustainable development is reflected in four themes with respect to the way of working.

Corporate social responsibility

Unilever's commitment to corporate social responsibility is considered as an integral part of their operating tradition that contributes to their success. These commitments are outlined in the Corporate Purpose (as stated in Subsection 8.4.1 on page 158) and in the Code of Business Principles (which is detailed below). It finds practical expression in the worldwide standards Unilever has set for itself: to ensure the health and safety of Unilever people at work, to secure the quality and safety of their products, and to minimize the environmental impact of their operations.

Unilever aims to be as professional in their management of social responsibilities as they are in any other area of business. They recognize the need to be explicit about what their social commitment means in practice: to articulate their policies, and to demonstrate their performance. Unilever reports on the approach taken and progress made in their Social Review, which is yearly published.

Code of Business Principles

The Code of Business Principles is a core Unilever statement about the ethics to be pursued in doing business. It is considered essential that all employees understand and comply with the values stated therein and therefore share the Unilever way of doing things. The code contains twelve principles: to conduct business with honesty and integrity and with respect for the interests of those with whom Unilever has relationships; to comply with the laws and regulations of the countries in which Unilever companies operate; to recruit, employ, and promote employees on the sole basis of the qualifications and abilities needed for the work to be performed; to expect from its employees that they avoid personal activities and financial interests which could conflict with their commitment to their jobs; neither to support political parties nor to contribute to the funds of groups whose activities are calculated to promote party interests; to provide products which consistently offer value in terms of price and quality, and which are safe for their intended use; to conduct business in an environmentally sound and sustainable manner; to believe in vigorous yet fair competition and to support the development of appropriate competition laws; to accurately describe and reflect the nature of the underlying transactions in accounting records and supporting documents; to not give or receive bribes in order to retain or bestow business or financial advantages; to apply this Code of Business Principles to Unilever companies throughout the world; to ensure that the principles embodied in this Code of Business Principles are communicated to, understood, and observed by all employees.

Reducing the impact on the environment

In partnership with organizations around the world, Unilever works to reduce their impact on the environment. The objective is to meet the needs of the present without compromising resources for future generations. In working towards sustainable devel-

opment, Unilever focuses on three areas that are directly relevant to its business: fish conservation, clean water stewardship, and sustainable agriculture.

Interaction with society

Unilever has a tradition to act as a responsible corporate citizen and to offer support for the local community wherever it operates, in particular in the areas of education, environment, and health. Unilever is multi-local in approach and it is recognized that their success is built upon the way they respond to local needs. They realize that this approach only works if they are truly part of the local culture in which they operate.

Unilever is committed to working directly and in partnership with public authorities and a range of different organizations to address important social, economic, and environmental challenges. Around the world its companies are active in projects to raise standards of education and training, to promote health, and initiatives to benefit the environment. The yearly published Social Review reports on the approach and activities undertaken.

8.4.3 Social, organizational, and technological factors

We follow the same approach to analyze Unilever Research & Development Vlaardingen as we applied to the cases Getronics Consulting and the Royal Netherlands Air Force (as described in Chapter 4 on page 41) and the case Ministry of Housing, Spatial Planning, and the Environment (as portrayed in Subsection 8.3.3 on page 138). Therefore we study the social, organizational, and technological factors that are related to knowledge sharing processes in Unilever Research & Development Vlaardingen.

8.4.3.1 The human factor

We argued in Section 3.5 (on page 30) that three elements of human behavior could be related to knowledge sharing: a person's motivation, skill level, and organizational role.

Unilever Research & Development Vlaardingen considers its people as valuable assets, and acts accordingly. Unilever is committed to creating an environment in which people can grow and reach their full potential. They realize that the willingness of their employees to embrace new ideas and learn continuously is key to the success of the company (Unilever, 2001). Unilever Research & Development Vlaardingen deploys a sophisticated, integrated approach to accomplish personal and professional growth of all their employees, through development of individual skills and competencies. Here, skills mean (visible) technical skills, expertise, and know-how; and competence means the (tacit) personal abilities and behavioral aspects of an individual.

In this approach each employee yearly assesses — with her or his manager — in what way her or his skills and competencies can be improved, which are entered into an agreement — the so-called Personal Development Plan — in order to realize these improvements (Unilever, 2001). Attainable targets are also agreed upon in these plans, which may win financial bonuses for that employee if they are met. These targets can be related to different levels of abstraction: they may be personal, or related to the results of a project, team, skill-base, organizational unit, product category, science area, or coupled to the overall result of Unilever. With respect to team targets the rule is that either or each team-member receives a bonus or nobody receives a bonus. A manager's target is mostly linked to the targets of his

or her employees. A great deal of time is spent to determine, discuss, and evaluate the targets. As a consequence of this system the yearly evaluations tend to be less subjective as they used to be and people experience this process as a fair system.

Within Unilever Research & Development Vlaardingen, eleven standard competencies (like 'Learning from experiences' and 'Team commitment') are defined and used in the yearly evaluations. The general phrases used to define these competencies are not always easily related to behavior observed in practice. Nor can a person's contribution to knowledge sharing be directly associated to these competencies.

Unilever Research & Development Vlaardingen distinguishes four skill levels: basic appreciation, working knowledge, fully operational, and leading edge. A number of skill-bases exist in the organization (in which employees are organizationally connected, based on their expertise and know-how) that are sometimes used to select project-members.

Knowledge sharing in Unilever Research & Development Vlaardingen is considered by most as an integral part of their job. A lot of people are involved with identifying and distributing good practices or with helping people to get to know other, relevant people. In addition several organizational units exist specifically to enable information and knowledge sharing. When we draw on our definitions of Subsection 3.5.2 (on page 33) we can identify the following roles in this organization: knowledge users, line knowledge managers, and competency knowledge managers.

8.4.3.2 The organizational factor

To study the organizational aspects that may influence knowledge sharing we — consistent with our observations as noted in Section 3.6 (on page 34) — typify the kind of organizational learning and we examine the organizational dimensions using the 7S framework.

In the previous section we noted that knowledge sharing is almost a transparent part of the way of working. The learning within Unilever Research & Development Vlaardingen can be typified as beyond single loop or adaptive learning and steady on its way to double loop or generative learning. Organizational attention is paid to what has been learned, the value of knowledge is realized, and serious efforts take place in the transformation into a learning organization. To underline this Niall Fitzgerald, Chairman of Unilever, expressed the following view in *Unilever Magazine*, issue 4, 2000: "The path to growth is all about bringing together Unilever's knowledge, learning, and understanding and applying it in a very focused way in the marketplace."

We describe the organizational dimensions of Unilever Research & Development Vlaardingen below.

Strategy

Unilever's strategy is to focus and to simplify. Research, development, and marketing will focus on their (400) top performing brands and the way of working shall be simplified (Unilever, 2001). New ways to reach and get into contact with the consumer will be explored and developed. Additionally, efforts are undertaken to enhance entrepreneurship of employees using the motto: passion for winning, liberating rigor, and connected creativity.

Sharing of knowledge in a research environment is common, but is further stimulated by support and commitment of topmanagement and through diverse initiatives like establishing communities of practice and integration of the several already existing intranets.

Structure

The Unilever Group has two parent companies: Unilever N.V. and Unilever PLC. Although these companies are separate legal entities, with separate stock exchange listings, in practice, Unilever operates as a single business with a single management team.

Unilever's top decision-making body is its Executive Committee of the Board, headed by the Group's joint chairmen. The Executive Committee is responsible for setting global strategy and for overall business performance.

Unilever's business is based on two global divisions: Unilever Bestfoods and Home & Personal Care. Both divisions have an executive board, responsible for divisional strategy and for implementation across the world.

The Foods division comprises the following categories: dressings and spreads, tea, health and wellness, and ice cream as well as the global foodservice business. The Foods division generates more than half of Unilever's sales. The Home and Personal Care division comprises eight categories: deodorants, hair care, household care, laundry, mass skin care, oral care, personal wash, and prestige products.

The divisions' operations are largely organized into business groups, the presidents of which report to the Unilever Bestfoods and Home & Personal Care Directors. The essential building blocks of Unilever's organization are the individual operating companies, active in their particular markets.

In Subsection 8.4.1 (on page 158) we mentioned the structure involved in innovation: the Regional Innovation Centers, Global Brand Centers, Global Technology Centers, and central research laboratories. Unilever Research & Development Vlaardingen is a combination of a Global Technology Center (that is responsible for applied research for certain product categories) and a central research laboratory (that carries out fundamental research in a number of science areas). In addition, also manufacturing research takes place in Vlaardingen.

Directly related to knowledge sharing activities are the science area Knowledge & Information Science and a specific designated organizational unit: the Knowledge Management Group (formerly called the Knowledge Mapping & Structuring Unit). Several other organizational units in Unilever Research & Development Vlaardingen employ people who are explicitly engaged in defining and developing procedures and policies that encourage knowledge sharing across organizational boundaries for a certain area of know-how.

Systems

Due to the scale and scope of Unilever their systems are designed to enable the sharing of information and knowledge across product sectors and geographical locations. Their computer networks provide employees worldwide with common tools for sharing information. The Unilever intranet facilitates innovation and best practice around the world. Global teams, for example, pool information, marketing success stories, and knowledge via dedicated sites, make this knowledge available to colleagues, wherever they are.

Leveraging the expertise and experience of specialists is done by bringing them together in knowledge workshops to combine individual practices into an agreed common practice in which their knowledge is captured in a structured way "so that it can be shared, developed, and applied globally" (Speel et al., 1999). These knowledge workshops are organized as highly interactive meetings with a strong involvement of top-

management. Speel et al. (1999) observe: "… knowledge workshops not only bring together knowledge dispersed across individuals and sites; total knowledge can increase as participants build on each other's experience and understanding. Furthermore, the electronic format of the results allows participants whose native language is not English to follow and remain involved in intensive debates; the collective format also allows instant hardcopies to be made of the results, without an extra stage of the circulation of and agreeing on minutes of the meeting."

Knowledge workshops identify knowledge gaps and have three types of deliverables: knowledge mapping, knowledge dissemination, and people-oriented deliverables (Speel et al., 1999):

Knowledge mapping

- A standardized terminology of products, product attributes, processes, and ingredients is defined and used throughout the workshop, which creates a shared understanding that forms the basis of knowledge sharing.
- Knowledge maps are created that visualize the knowledge that has been captured.
- An overview of "what is known" is captured in a structured format: tacit knowledge is made explicit.
- Knowledge creation takes place because participants can build upon others' experiences and understanding: existing knowledge is combined.
- Project proposals to fill the identified knowledge gaps are formulated.

Knowledge dissemination

- The complete output of the knowledge workshop is described in a written report.
- An electronic system contains the captured knowledge in a semi-structured format, using the knowledge map structure that was developed during the workshop. This captured knowledge is made available through the intranet.

People-oriented deliverables

- Individual learning of participants takes place because they not only provide their own knowledge to the workshop, but they also receive knowledge from others.
- Trust is built between the experts. Through the intense knowledge workshop process they get to know each other very well. This establishes a bond, and the experts continue to work together afterwards.
- Such a network often lays the foundation for a community of practice.
- Solutions to pressing local problems of the participants can be obtained through discussions in the workshop. Sometimes participants may find that counterparts in other parts of the world had already dealt with similar problems.

In Subsubsection 8.4.3.3 we describe in more detail the information and communication technology as employed by Unilever Research & Development Vlaardingen.

Staff, skills

The human factor, including staff and skills, in knowledge sharing is treated in Subsubsection 8.4.3.1. We observed that Unilever Research & Development Vlaardingen has set up an extensive system to leverage the skills and competencies of its people.

Style

Behavior of management is intensely influenced by the Code of Business Principles (as explained in Subsection 8.4.2 on page 159) as well as the other guiding principles of the way of working: corporate social responsibility, reducing the impact on the environment, and interaction with society. Management is encouraged to behave with integrity and with respect for the interests of those that are affected by their activities (in fact, compliance with the Code is regularly monitored). This behavioral objective is shared with all employees to stimulate likewise conduct in the way of doing things.

Due to some major mergers and acquisitions Unilever Research & Development Vlaardingen finds itself in a turbulent situation, with a high volatility in the structuring of the organization. This shaped an ongoing process of commercialization, consolidation, and concentration that resulted in a somewhat less congenial style of management.

Shared values

Unilever Research & Development Vlaardingen can be described as a network-organization: one can always contact or visit another person, management is remarkably approachable, and the climate is especially open and helpful. Some consider proper management of bilateral contacts critical for one's career. It is accepted to make mistakes, but learning from them is essential (to make the same mistake twice is not appreciated). A characteristic of this type of environment is the fact that some researchers are rather opinionated and only hesitantly accept the ideas of others (for it was 'not invented here'). Nevertheless the view prevails that although it shows otherwise on the surface, people are indeed listening to the thoughts of others. The decisions taken are often of high quality in which all views are considered.

A possible drawback for knowledge sharing is the use of yearly cycles (for instance for rewarding people and organizational units), which may enforce attention on the short term and direct benefits. Another obstacle may be the fact that scientists are not inclined to share great ideas for these ideas give an impetus to their career.

Because of the used apportionment of budgets and labor competition arises as a result of which some politics between organizational units occurs. Differences in culture exist between the divisions Foods and Home & Personal Care, between the central laboratories in Colworth and Vlaardingen, between product categories, between science areas, and between marketers (who are more focused on the short term) and researchers (who concentrate more on the long term).

8.4.3.3 The technology factor

Unilever is exploring possibilities in information and communication technology to support direct contact with its consumers. Unilever uses web technologies for marketing, purchasing, supplier-, and consumer-management (Unilever, 2001). Internet also proves to be a valuable tool in increasing efficiency in the production- and distribution-chain (Unilever, 2001). As already mentioned in the previous section, the computer networks of Unilever connect employees worldwide. Through intranets people can easily exchange data, information, and knowledge.

An interconnected environment — that enables people to electronically communicate, collaborate, and to share information and knowledge: any-time, any-place — can be constructed by the use of tools (as described in Section 3.7 on page 37). In Unilever Research & Development Vlaardingen some very sophisticated systems are in place to realize such an interconnected environment.

The organizational unit Information Services of the science area Knowledge & Information Science in Unilever Research & Development Vlaardingen offers the following services: acquisition (of for instance worldwide licenses with content suppliers, for example to obtain electronic versions of scientific magazines), storage, and distribution of internal as well as external created information; signaling of scientific literature; information search and retrieval; literature search in scientific and patent databases; patent research; and patent application. These services require standardization on information and communication

technology tools such as the browser, full-text database system and retrieval engine, full-text carrier, groupware, relational database management system, and individual bibliographical database system. A major challenge is the integration of these tools and their data so that they appear as one — transparent — system to the user. These services are increasingly been offered through the desktop computer of the user: a key service is the so-called Personal News Service system. The functionality of this advanced system is twofold. On the one hand this is an automatic signaling system on the newest scientific information from several internal and external sources (like internal research reports and electronic versions of more than 450 scientific magazines). The users themselves create their interest profiles. Using these interest profiles the database is searched — on a daily basis — for relevant documents, the so-called 'hits'. These hits are shown to the user, including an abstract of the document and — if available — including a hyperlink to the full-text version of the document. On the other hand the Personal News Service system offers access to the 'Web of Science' of the Institute of Scientific Information that contains the 'Science Citation Database'. This Science Citation Database holds hyperlinks to the cited sources of references. Other online services offered are: an electronic version of the library catalogue, numerous internal and external databases, internal and external telephone directories, and document delivery (an electronic ordering tool for books, magazines, documents, and articles).

As a consequence of the scope and size of Unilever Research & Development Vlaardingen an abundant number of information sources (databases, web-portals) came into being. These are not always interconnected, or offered in a coherent way. Efforts are underway to integrate or link these systems, to clarify what is stored and where, and to create a uniform look and feel.

Using the segmentation of information and communication technology functionalities that can support knowledge sharing as defined by Anderson and Smith (1998, see Subsection 3.7.2 on page 39: office applications, groupware, document systems, work process systems, analytical systems, and knowledge systems) and the herewith related tools (as described in Appendix C on page 215) in the case Unilever Research & Development Vlaardingen, we present the following characterization:

Office applications

E-mail and messaging systems

E-mail is an indispensable form of communication, besides face-to-face meetings, (mobile) telephone, voice mail, facsimile, and memorandums.

Calendaring and scheduling

For most personnel tools are deployed to maintain and monitor a to-do list, record appointments, to give insight into the calendars of team members, and to schedule meetings.

Personal productivity applications

These applications such as word processing, spreadsheets, and creating presentations come as a standard element of an electronic workplace.

Groupware

Same time - different place

Chat systems; application sharing systems; shared whiteboards; collaborative virtual environments; video conferencing systems

The people at Unilever Research & Development Vlaardingen have a video conferencing system at their disposal, but usage is — in spite of the many geographical locations of Unilever — low.

Different time - different place

Electronic discussion systems; co-authoring systems

Intranet environments offer electronic discussion systems. These systems are mostly used by members of communities of practice and communities of interest (the two types of communities present within Unilever). Unilever Research & Development Vlaardingen also employs a co-authoring system.

Document systems

Integrated document management

The Personal News Service system, which we described above, is a manifest example of an integrated document awareness system. The usage of and appreciation for this system is high.

Document imaging

Document imaging supports the transfer of paper documents into electronic form. This only takes place within Unilever Research & Development Vlaardingen when it is unavoidable but necessary.

Work Process systems

Work management systems; process support systems; expert systems; constraint-based systems; case-based reasoning; neural networks; electronic forms

Work process systems are used in some locations in Vlaardingen to support the management of the (workflow of the) research processes.

Analytical systems

Decision support systems; data warehouse; data mining; business intelligence

Usage of analytical systems mostly occurs for marketing purposes and is not common in Unilever Research & Development Vlaardingen.

Knowledge systems

Information and knowledge retrieval

Internet

The Internet is for almost all employees accessible through the intranets.

Intranet

In Unilever Research & Development Vlaardingen one common intranet infrastructure is in place on which several websites or intranets exist. Activities are underway to make these intranets more homogeneous. A lot of effort is put in standardizing the technical issues, after that the content (structure, style, and so on) is to be harmonized.

Online learning

At the moment not much interactive, multimedia learning via the computer takes place.

Knowledge management

Knowledge databases and repositories

There is an abundance of knowledge databases and repositories available. Activities are underway to create more overview on and coherence between these systems.

Knowledge routemaps and directories

As explained in Subsubsection 8.4.3.1, skill-bases are organizational structures that connect employees, based on their expertise and know-how. These skill-bases help to locate people in the organization who possess a special proficiency.

Knowledge networks and discussions

This category focuses on tacit knowledge by providing opportunities for electronic interaction between people. Communities of practice and communities of

interest (who are less structured and less demanding than a community of practice) are platforms that apply tools to support interaction. Teamworking tools such as Autonomy, LiveLink, MindManager, and Lotus Notes are been deployed.

8.4.4 Assessment of existing conditions

Our findings from the interviews and internal publications have led to the following assessment of the fulfillment of the conditions prevalent in Unilever Research & Development Vlaardingen. The assessments (in the interval between 1 and 10, to specify a *not present* up to a *completely fulfilled* condition) and their justification are given in Table 8.4 below.

	Condition	Value	Justification
Social	appraisal	**7**	In the yearly appraisal process the targets described in the Personal Development Plans are evaluated. At this moment rewarding of knowledge sharing is not standard (some consider this as a regular part of their job), but steps are been taken to change this by introducing more instruments to reward desired (individual and team) behavior.
	care	**5**	The organization is regarded as friendly, but not as affectionate. The interviewees often considered care to be personally dependent on their manager. This may suggest that there are no specific guidelines in Unilever Research & Development Vlaardingen that emphasize the importance of caring for your employees. The ongoing process of commercialization, consolidation, and concentration we mentioned in Subsubsection 8.4.3.2 is an intensive process that may have as a consequence that management lacks the time needed to acquaint oneself with the details of the daily activities of one's employees.
	competence leverage	**10**	The awareness of management that the success of the organization is dependent on the leverage of the potential of their employees is evident. Competence leverage is done through a mature and highly developed system (as described in Subsubsection 8.4.3.1) in which the yearly created Personal Development Plans play a pivotal role in increasing the skills and competencies of people. The majority of the interviewees are contented with the way this system operates in practice.
	empowerment	**8**	Some difference exists in the level of empowerment between researchers on one side and analysts and supportive personnel on the other side. This seems related to the seniority of a person and the freedom one has in determining one's work content and products. In Unilever Research & Development Vlaardingen it is possible to — after consultation with one's manager — create more empowerment: everybody can take the initiative as long as the targets agreed upon will continue to be met. Not everybody is inclined to do so, but because management realizes that more empowerment generates more responsibility in the realization of one's job, programs have been started to stimulate this.

	Condition	Value	Justification
	knowledge crew	**9**	Quite some people in Unilever Research & Development Vlaardingen are occupied with the stimulation of knowledge sharing. In Subsubsection 8.4.3.2 we mentioned the science area Knowledge & Information Science (especially the departments Information Services, Information Systems Development, and Facilitation) and the Knowledge Management Group. Also other organizational units employ people that we identify as knowledge crew.
	trust	**6**	The level of trust in one's immediate environment is satisfactory, but on a wider scale it is negatively influenced by internal competition and politics because of funding and personal career aspirations.
Organizational	climate of openness	**8**	There is a climate of openness in Unilever Research & Development Vlaardingen: it is easy to ask questions and get answers, it is simple to contact management, criticism is of a constructive nature, and errors are allowed and discussed. People are not always forthcoming, possible due to political interests.
	collaboration	**6**	Work is increasingly been done in multidisciplinary teams. In Subsubsection 8.4.3.1 we mentioned the team targets that encourage collaboration. However, people tend to stay a bit focused on their own, personal successes.
	community	**9**	Unilever distinguishes two types of communities: communities of practice and communities of interest. These communities are recognized as an effective vehicle for sharing knowledge. Therefore specific policies, guidelines, experts and facilitators, trainings, tools, and documentation exist to stimulate their existence and which created their present success. People consider it an honor to be member of a community of practice and top management — in both a so-called Champion and Stakeholder role — is heavily involved (and they have the authority to realize thought-up solutions).
	dialogue	**7**	People listen to each other and can empathize with colleagues. Sometimes dialogue in Unilever Research & Development Vlaardingen is hindered by the 'not invented here' syndrome. This behavior is discouraged through coach- and feedback training with an emphasis on listening to another person with the objective to understand that other person instead of trying to overrule the other person with one's own ideas.
	knowledge champion	**5**	Topmanagement proclaim their view on the importance of knowledge sharing, and there are a number of 'local' knowledge champions but there is not a knowledge champion active at Executive Board level of Unilever Research & Development Vlaardingen.
	learning organization	**7**	In Subsubsection 8.4.3.2 we typified the organizational learning of Unilever Research & Development Vlaardingen as beyond single loop learning. Organizational learning takes place by bringing together people and available knowledge, learning from experiences and each other, and utilizing this to improve products. The means (commitment, money, capacity, and systems) to do this are available and are been operated in practice.
	metric	**5**	There is no apparent measurement on 'Return on Knowledge'. Communities of practice yearly define deliverables and some usage statistics of intranets are registered. Intentions are present to introduce balanced score cards, amongst others for assessment reasons.

	Condition	Value	Justification
	organically structured organization	**7**	Because research is oriented towards the long term, its organizational structure is not extremely flexible. However, due to the strategy of Unilever of swift reaction to changes in the market, research is increasingly linked to development. Therefore organizational developments in Unilever Research & Development Vlaardingen are more and more connected with developments in the environment i.e. the market. Because Unilever Research & Development Vlaardingen has a limited number of hierarchical layers, urgent research related issues could be dealt with effectively. In addition, the project oriented way of working results in more flexibility and in less emphasis on one's organizational unit. On top of this, there is an active Human Resource department on corporate Unilever level that often puts advanced human resource ideas into practice, which has a positive bearing on the way people are treated in Unilever Research & Development Vlaardingen.
	slack	**7**	Slack is not formally regulated, but employees do have some freedom to spend time on matters like self-tuition and reflection. As part of a Personal Development Plan one can also agree on a personal target that defines spending a percentage of the working time to create a transition from the present skill level into the next level.
	system integrated into daily workprocess	**6**	The complexity of the organization brings about numerous systems with diverse functionalities to support the way of working. Some systems fail to create a perception of added value, which has its implications on the creation and maintenance of its content and therefore on its usage. Efforts are underway to integrate these systems and make combined usage more transparent to the user. An example is the 'Science Workbench' that presents the daily needed tools in a conveniently arranged way.
Technological	collaborative platform	**7**	In Subsubsection 8.4.3.3 we mentioned some information and communication technology tools like Autonomy, LiveLink, MindManager, and Lotus Notes that support collaboration in Unilever Research & Development Vlaardingen. Others tools employed are co-authoring and videoconferencing systems. Communities make frequent use of electronic discussion tools.
	knowledge repository	**9**	We described the sophisticated Personal News Service system in Subsubsection 8.4.3.3. In addition, several intranets, knowledge databases, and repositories are in use. This hampers the establishment of a total overview of what is stored and in which repository.
	knowledge routemap	**7**	The skill-bases help to locate experts in Unilever Research & Development Vlaardingen. In addition, the communities of practice and communities of interest offer links to employees whose expertise may be needed. Best practices (of for example manufacturing) are described in company-standard (blue, yellow, and orange) product books.

Table 8.4: Assessment of conditions existing in Unilever Research & Development

The values of these assessments for all type of conditions are shown in Figure 8.3 (on page 171). We see from this figure that the overall fulfillment of the conditions is high, from which we may conclude that in this organization there exists a strong facilitation of knowledge sharing.

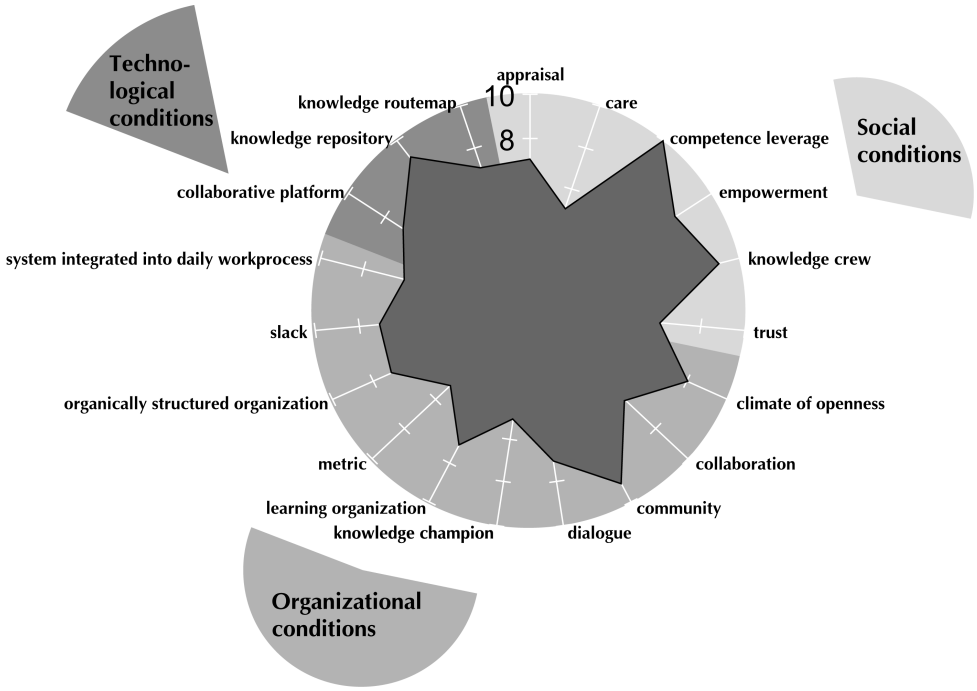


Figure 8.3: Assessed conditions in Unilever Research & Development

8.4.5 The applicable knowledge sharing phase

Because Unilever Research & Development Vlaardingen is increasingly linked to development and therefore strongly connected with the environment i.e. the fast-moving consumer market, we argue that they operate under a personalization strategy.

We use the values that result from the assessment of the enabling conditions (as reported in Table 8.4 above) in the next step of our repeating process of assessment and action (that we presented in Section 7.7 on page 123) to obtain an indication of the level of knowledge sharing in Unilever Research & Development Vlaardingen (as described in Appendix D on page 227). Using Table D.1 (on page 232) this indication helps us to determine the knowledge sharing phase that is applicable to this organization. This means that for Unilever Research & Development Vlaardingen the *knowledge routemap phase* under a personalization strategy is the most appropriate to indicate the level of development with respect to knowledge sharing.

8.4.6 Selection of conditions most appropriate to stimulate

We identified in Subsection 8.4.5 (on page 171) the knowledge routemap phase as the most appropriate knowledge sharing phase for Unilever Research & Development Vlaardingen. The present fulfillment of the enabling conditions (as presented in Table 8.4 on page 170) calls for a transition from the knowledge routemap phase into the knowledge repository phase. In Table 6.3 (on page 111) we see that the conditions that are related to the knowledge repository phase are: system integrated into daily workprocess and knowledge repository. We remark that due to its high fulfillment there is no need to put much extra effort in stimulating the condition knowledge repository.

To select other conditions to stimulate we look at the conditions from the current and preceding phases with a fulfillment that can be improved (i.e. an assessed value of 7 or lower). With respect to the collaborative platform phase these are: trust, care, appraisal, slack, dialogue, knowledge champion, collaboration, collaborative platform, and with regard to the knowledge routemap phase they are: metric and knowledge routemap.

8.4.7 Observation and analysis

8.4.7.1 Current situation

Following the findings from our interviews we consider, with respect to knowledge sharing, the following existing issues in Unilever Research & Development Vlaardingen as the most relevant concerns: organizational turmoil, pace of change, internal competition, overview of information, and technology versus content. We elaborate on these issues below.

- We reported in Subsubsection 8.4.3.2 that Unilever has experienced some major mergers and acquisitions. Overlap of functionalities, refocusing of its business strategy, and cost reductions caused organizational restructuring of duties and responsibilities. The uncertainty in Unilever Research & Development Vlaardingen that resulted from this organizational turmoil has a negative effect on the motivation of people, the human resource activities, and the style of management.
- Unilever operates in the fast-moving consumer market. The ability to innovate, to have (personalized and creative) contact with the consumer, and to decrease the time to market are decisive competitive factors. Because of the increased linkage of research to development and therefore to the market, Unilever Research & Development Vlaardingen experiences a step up in their pace of change. This combined with the leverage effect of technology requires more synergetic effort by several, heterogeneous experts and a faster regeneration of capabilities, knowledge, and skills.
- Cooperation, communication, and collaboration are sometimes hindered by internal competition and politics. This is possibly caused by the way the funding and the apportionment of labor take place or because of someone's individual career aspirations. The deficiency to pursue a collective objective augments mistrust and obstructs the sharing of information and knowledge.
- In Subsubsection 8.4.3.3 we observed that the size and scope of Unilever Research & Development Vlaardingen resulted in an abundant number of information and knowledge repositories. The lack of a total overview of what is stored and in which (sometimes isolated) repository makes it hard to locate and access the information or knowledge needed.
- Efforts are underway to integrate or link these information and knowledge repositories and make them more uniform. However, it appears that the people involved with these operations are subject specialists who mainly concentrate on solving technical problems, whereas they should be focusing on the content of these systems and should leave the technical challenges to especially trained technicians.

8.4.7.2 Influencing developments

Analogue to our study of the Ministry of Housing, Spatial Planning, and the Environment we describe trends that indicate potential future developments. The possible improvements that we will propose in Subsubsection 8.4.7.3 should be in line with these anticipated

developments. Based on the information we gained from our interviews we expect the following developments to become relevant for knowledge sharing in Unilever Research & Development Vlaardingen: world population growth, changing role of laboratory, integrated solutions, and functional foods.

- In Subsection 8.4.2 (on page 159) we mentioned the expected growth of the world population by 2 billion in the year 2025, totaling 8 billion people then. This implies that in 2025 global food production will have to rise by a factor of 4 to 5 and that more effective manufacturing techniques will become mandatory.
- The role of Unilever Research & Development Vlaardingen as a scientific laboratory is changing. Fundamental research will increasingly be carried out in collaboration with external research institutes (contract research) and the internal research focus will shift to more applied science with an emphasis on development and delivery. The focus will move from theory formulation to application of theory, from writing scientific articles to the usage of scientific theory conjectured by third parties, from conducting experiments to combining already existing knowledge.
- The increasing complexity of society, changes in the habits and behavior of the consumer, and the advent of new technologies such as biotechnology create a need for integrated solutions.
- The substantial growth of the world population and the foreseeable improved overall health conditions in the world will also result in a significant increase in the number of elderly people. This will create an attractive market for consumer foods that have a positive effect on health, the so-called functional foods or health enhancing foods.

8.4.7.3 Directions for improvement

In the Table 8.5 below we correlate the issues of the current situation (as discussed in Subsubsection 8.4.7.1) with possible future developments (that we described in Subsubsection 8.4.7.2) to gather opportunities for improvement with respect to knowledge sharing in Unilever Research & Development Vlaardingen.

	Take advantage of world population growth	**Cope with changing role of laboratory**	**Facilitate integrated solutions**	**Create functional foods**
Reduce organizational turmoil		• assign personal coaches that will help people coping with the changes in their work and organization; • give employees a say in the direction Unilever Research & Development Vlaardingen should take	• assemble a heterogeneous strategy team that comes up with suggestions how to reduce organizational turmoil	
Cope with pace of change	• establish a community of practice on world population growth	• provide time and space for reflection; • recruit employees from outside Unilever that show flexible behavior and who bring in new knowledge; • evaluate whether the current organizational structure is customer and supplier friendly; • extend the communication between Unilever	• create learning networks with consumers, suppliers, and affiliated organizations / research institutes; • define and offer programs to improve the skills in knowledge sharing (for instance through communication, example behavior, awards, and educational material)	• set up a community of practice on functional foods; • facilitate frequent contact with consumers (develop a partnership with them on the basis of mutual benefits)

	Take advantage of world population growth	Cope with changing role of laboratory	Facilitate integrated solutions	Create functional foods
		Research & Development Vlaardingen and the development people of 'Business' (i.e. the internal customers) to include also their marketing people • develop partnerships with suppliers; • stimulate intensive collaboration and develop partnerships with affiliated organizations (research institutes, universities, public bodies, consumer groups, interest groups, and so on); • make unambiguous appointments about knowledge transfer when hiring external experts		
Eliminate internal competition	• start brainstorm teams to examine world population growth, rotate membership	• stimulate and facilitate discussion sessions, workshops, and knowledge fairs on the changing role of the laboratory; • appoint an involved top manager as the knowledge champion; • let topmanagement demonstrate example behavior (train them to do so) and evaluate them on this; • introduce an extra competency directly related with knowledge sharing; • create possibilities for the building of trust relations (also by facilitating informal face-to-face contacts, for example by creating areas — like the new library — where social interaction can take place); • stimulate exchange of employees with affiliated organizations	• adapt the funding process so that a change in one budget does not occur at the expense of another budget; • make career progress dominantly dependent on team or collective performances; • offer (online) trainings in collaboration enhancing behavior, for example in the techniques of dialogue and discussion; • encourage job rotation Unilever worldwide and offer smooth procedures to encourage and support this; • increase cooperative behavior between organizational units through combined projects, committees, study groups etc in which participants hold a shared responsibility; • stimulate usage of the videoconferencing system (investigate whether a desktop videoconferencing system is required); • have the employees jointly develop a new code of conduct in relation to knowledge sharing; • arrange periodical meetings in which research results are explained and discussed with colleagues; • give insight (on a continuous basis) what research has been done,	• institute brainstorm teams to discover possible functional foods, rotate membership

	Take advantage of world population growth	Cope with changing role of laboratory	Facilitate integrated solutions	Create functional foods
			what is underway, and which initiatives or plans for new research do exist	
Improve overview of information	• store the results of the community of practice and brainstorm sessions on how to take advantage of the world population growth online in the worldwide intranet, structured by a clear classification	• create the infrastructure to easily exchange data, information, knowledge, and (research) models with affiliated organizations such as external research institutes; • create a workflow management system to facilitate the process of contracting out research; • keep in contact with employees who resigned from Unilever Research & Development Vlaardingen (to broaden the network and to learn from their experiences)	• appoint employees as information specialists or knowledge brokers specifically in charge for searching, collecting, and distributing knowledge, and who function between users and information resources to reduce information overload; • create a knowledge routemap of Unilever Research & Development Vlaardingen that helps in locating people by expertise, community, skills, the projects they are currently working on or were involved with, interests, and affiliation; • implement an Enterprise Knowledge Portal as *the* starting point for online activities and that offers tools that aid in the navigational and retrieval process	• create a taxonomy of functional food related issues; • store information about functional food in a specific designed knowledge portal according to the defined taxonomy
Discriminate technology versus content		• define a number of flexible procedures to organize (and formalize) cooperation with affiliated organizations that enable efficient contract research; • combine purchase efforts with respect to contracting out research (to reduce costs); • institute a knowledge sharing award and define and communicate the criteria for winning this	• make (internal and external) specialists and experts more visible and offer easy access to them; • realize more communication and collaboration between content and technical experts and leave technical matters to the specialists; • analyze, select, and implement tools that support collaboration, thinking, and reflection	

Table 8.5: Issues of consideration correlated with possible trends

8.4.8 Proposed stimulations of conditions involved

We propose the following possible stimulations of the conditions selected (as recorded in Subsection 8.4.6 on page 171), considering the given justification of the assessment of the fulfillment of the enabling conditions (as described in Subsection 8.4.4 on page 168), the personalization strategy employed (that was assumed in Subsection 8.4.5 on page 171), and our analysis of Unilever Research & Development Vlaardingen (as addressed in Subsection 8.4.3 on page 161), Table 7.2, and Table 8.5 (on page 123 and 175 respectively).

Trust

- Create possibilities for the building of trust relations (also by facilitating informal face-to-face contacts, for example by creating areas — like the new library — where social interaction can take place).
- Make career progress dominantly dependent on team or collective performances.
- Encourage job rotation Unilever worldwide and offer smooth procedures to encourage and support this.
- Extend the communication between Unilever Research & Development Vlaardingen and the development people of 'Business' (i.e. the internal customers) to include also their marketing people.
- Stimulate intensive collaboration and develop partnerships with affiliated organizations (research institutes, universities, public bodies, consumer groups, interest groups, and so on).
- Stimulate exchange of employees with affiliated organizations.
- Develop partnerships with suppliers.

Care

- Care can be cultivated through stimulation of relationships by stating "trust, openness, and courage as explicit values by topmanagement, and as formulated expectations for the behavior of organization members. Explicitly stated values … need to be visible in everyday managerial actions" (Krogh, 1998).
- Establish "training programs in care-based behavior that show organization members care in practice and how to encourage care in relationships. The emphasis should be on learning how to help, present personal insights, develop concepts, and justify new ideas while exercising lenience in judgment" (Krogh, 1998).
- Assign personal coaches that will help people coping with the changes in their work and organization.
- Allot management more time to acquaint themselves with the details of the daily activities of their employees.

Appraisal

- Introduce an extra competency directly related with knowledge sharing that helps to assess desired (individual and team) behavior.
- Define "two sets of responsibilities for the individual, each of which should grow proportionally: the responsibility to acquire expertise; and the responsibility to make your help accessible to those who need it as your expertise grows" (Krogh, 1998) and incorporate this into the human resource development practice (and appraisal system).
- Define and introduce a compensation and reward scheme for individuals and teams for contributing knowledge to the organization and for using knowledge from the organization and incorporate this in the annual performance appraisal and evaluation process.
- Institute a knowledge sharing award and define and communicate the criteria for winning this.

Slack

- Provide time and space for reflection. Allocate to employees a percentage of their time to spend on learning, reflection, dialogues, and sharing activities they chose themselves. Relate this percentage to the seniority of the employee (because senior employees are considered to be more autonomous and less susceptible to irrelevant distractions).
- Consider setting periods of the workday aside specifically for learning and sharing.

- Offer employees resources to cope with the demands on their time. An organization can reduce demands, prioritize demands, focus only on a few critical activities, and reengineer or simplify work processes (Ulrich, 1998).
- Introduce a system that allows an employee to take a sabbatical year after for example five years of service.

Dialogue

- Offer (online) trainings in collaboration enhancing behavior, for example in the techniques of dialogue, story-telling, discourse, and discussion.
- Stimulate and facilitate discussion sessions, workshops, and knowledge fairs on the changing role of laboratory.
- Give employees a say in the direction Unilever Research & Development Vlaardingen should take.

Knowledge champion

- Appoint an involved top manager as the knowledge champion (and who can act as the Chief Knowledge Officer).
- Let topmanagement demonstrate example behavior (train them to do so) and evaluate them on this.
- Topmanagement should, according to Elliott (1997a): "identify successes in your organization that resulted from more effective access to and sharing of knowledge … use them to build support and understanding."
- Have the employees jointly develop a new code of conduct in relation to knowledge sharing.

Collaboration

- Adapt the funding process so that a change in one budget does not occur at the expense of another budget.
- Establish a community of practice on world population growth.
- Set up a community of practice on functional foods.
- Assemble a heterogeneous strategy team that comes up with suggestions how to reduce organizational turmoil.
- Start brainstorm teams to examine world population growth, rotate membership.
- Institute brainstorm teams to discover possible functional foods, rotate membership.
- Offer programs to improve the skills in knowledge sharing (for instance through communication, example behavior, awards, and educational material).
- Increase cooperative behavior between organizational units through combined projects, committees, study groups etc in which participants hold a shared responsibility.
- Define a number of flexible procedures to organize (and formalize) cooperation with affiliated organizations that enable efficient contract research.
- Assemble process improvement teams whose members come from both Unilever and from affiliated organizations.

Collaborative platform

- Evaluate whether the current organizational structure is customer and supplier friendly.
- Create learning networks with consumers, suppliers, and affiliated organizations / research institutes.
- Facilitate frequent contact with consumers (develop a partnership with them on the basis of mutual benefits)
- Arrange periodical meetings in which research results are explained and discussed with colleagues.

- Stimulate usage of the videoconferencing system (investigate whether a desktop videoconferencing system is required).
- Analyze, select, and implement tools that support collaboration, thinking, and reflection.

Metric

- Define and implement procedures to measure the 'Return on Knowledge'.
- Define measures to capture knowledge contributions and to monitor the individual development and contributions of a person. Also define measures to capture team developments.

Knowledge routemap

- Recruit employees from outside Unilever that show flexible behavior and who bring in new (state-of-the-art) knowledge.
- Keep in contact with employees who resigned from Unilever Research & Development Vlaardingen (to broaden the network and to learn from their experiences).
- Make unambiguous appointments about knowledge transfer when hiring external experts.
- Appoint employees as information specialists or knowledge brokers specifically in charge for searching, collecting, and distributing knowledge, and who function between users and information resources to reduce information overload.
- Create a (virtual) helpdesk that acts as an intermediary between people with a question and dedicated experts and corporate-wide knowledge.
- Give insight (on a continuous basis) what research has been done, what is underway, and which initiatives or plans for new research do exist.
- Store the results of the community of practice and brainstorm sessions on how to take advantage of the world population growth online in the worldwide intranet, structured by a clear classification.
- Create a taxonomy of functional food related issues.
- Store information about functional food in a specific designed knowledge portal according to the defined taxonomy.
- Make (internal and external) specialists and experts more visible and offer easy access to them.
- Create a knowledge routemap of Unilever Research & Development Vlaardingen (involve the skill-base leaders in this activity) that helps in locating people by expertise, community, skills, the projects they are currently working on or were involved with, interests, and affiliation.
- Realize more communication and collaboration between content and technical experts and leave technical matters to the specialists.

System integrated into daily workprocess

- Systems can be integrated into daily workprocesses by understanding the daily behavior of employees. Expand existing systems accordingly or introduce systems that seamlessly work together with already existing systems and technology choices so that they support this daily behavior.
- Implement an Enterprise Knowledge Portal (with a taxonomy to structure the internal information and knowledge repositories) as the starting point for online activities and that offers tools that aid in the navigational and retrieval process.
- Create the infrastructure to easily exchange data, information, knowledge, and (research) models with affiliated organizations such as external research institutes.
- Create a workflow management system to facilitate the process of contracting out research.

8.4.9 Suggested approach and result

Unilever Research & Development Vlaardingen is — for quite some time now — exceptionally active in knowledge sharing and has already some impressive processes, procedures, and systems in place. The possible stimulations of a number of relevant enabling conditions, as we described in Subsection 8.4.8 (on page 175), should be seen as a confirmation of the knowledge sharing program carried out by Unilever, and may help to increase the level of knowledge sharing even further.

The outcome of our research was discussed with managers of the science area Knowledge & Information Science. The result of this discussion was presented to the interviewees and their feedback was incorporated in this study.

The intention is to organize — at a proper time — a workshop for topmanagement of Unilever Research & Development Vlaardingen to discuss a small subset from the possible stimulations of the enabling conditions and to find a sponsor to realize the necessary activities.

The subset of stimulations is chosen according to their potential value proposition. On an estimated calculation of needed effort versus potential return, we judge the following stimulations to have the highest value proposition:

1. Introduce an extra competency directly related with knowledge sharing.
2. Have the employees jointly develop a new code of conduct in relation to knowledge sharing.
3. Institute a knowledge sharing award and define and communicate the criteria for winning this.
4. Offer (online) trainings in collaboration enhancing behavior, for example in the techniques of dialogue, story-telling, discourse, and discussion.
5. Appoint an involved top manager as the knowledge champion.
6. Adapt the funding process so that a change in one budget does not occur at the expense of another budget.
7. Define and implement procedures to measure the ‘Return on Knowledge’.
8. Establish a community of practice on world population growth. Set up a community of practice on functional foods.
9. Create a knowledge routemap of Unilever Research & Development Vlaardingen.
10. Implement an Enterprise Knowledge Portal.
11. Define a number of flexible procedures to organize (and formalize) cooperation with affiliated organizations.
12. Create learning networks with consumers, suppliers, and affiliated organizations / research institutes.

Regrettably, no such workshop for topmanagement has been held. The organizational turmoil we mentioned in Subsubsection 8.4.7.1 (on page 172) necessitated postponement of the workshop for several times. After a while nobody made an effort anymore. This may indicate that, despite the fact that the value of knowledge and of knowledge sharing is realized, in critical situations all attention is focused on coping with immediate problems in stead of preparing ground to attain an uncertain long-term effect.

8.5 Conclusion

We described in this chapter our prescriptive empirical model in three different organizations. For each case we described their specific characteristics and their way of working. The social, organizational, and technological factors that are related to knowledge sharing processes were analyzed. We assessed the fulfillment of their enabling conditions, determined their knowledge sharing strategy, and ascertained the applicable knowledge sharing phase of each organization. The conditions most appropriate to stimulate were selected and the most viable way to do this was described. Approaches were suggested to realize these stimulations.

Reflecting on what we learned from our cases we contend that the identification of the applicable knowledge sharing phase does not contradict the perception that people have with respect to the level of development of knowledge sharing in their organization. We observed that interviewees have trouble determining the right scope for their assessment of conditions: some they are able to assess for the whole organization but some are assessed as applicable to their department only. This hampers consolidation of the interview results. Several interviewees are inclined to give their organization a higher mark as reality would call for, for example they assess the condition knowledge champion as 5 while no such person is present. It seems they kind of 'protect' the image of their organization for an external person (i.e. the interviewer). We recognize that the interviewer has to possess a certain amount of experience and quality to be able to elicit non-superficial justifications of the assessments made. We argue it would not work to assess enabling conditions in an organization by means of a written questionnaire: it is the justifications that create insight into the situation with respect to knowledge sharing. We experienced that the involvement of management is crucial for knowledge sharing. Several suggested stimulations of enabling conditions require a major organizational change, but all suggestions require some effort on the part of management — for example to reserve capacity and budgets, initiate projects and see them through.

Our suggestions we made to improve knowledge sharing did not produce any significant results. In Section 8.1 (on page 127) we proposed, as a way to validate that the conditions we identified and presented in Chapter 5 (on page 65) indeed influence and enable knowledge sharing, to "assess the degree of fulfillment of the enabling conditions, undertake appropriate activities to improve these conditions, and evaluate whether the level of knowledge sharing has changed." Because the improvement activities did not take place in the case studies, we fall short of validating — through this method — that we identified the proper enabling conditions. Therefore we will, in the next chapter, try to validate our model using expert interviews. In the next chapter we will also reflect on our experiences with the prescriptive empirical model.

9 REFLECTION AND VALIDATION

Doubt grows with knowledge.
J.W. von Goethe

9.1 Introduction

As part of the final step of the inductive-hypothetical model cycle we evaluate our prescriptive empirical model. In Section 1.5 (on page 9) we wrote that the primary objective of this dissertation is to systematically study, identify, and understand the enabling conditions to help organizations to become more effective in knowledge sharing. We use the experiences from the realization of our repeating process of assessment and action in three dissimilar organizations to reflect whether our prescriptive empirical model tallies with and confirms the primary objective of this dissertation. This reflection is presented in Section 9.2.

In Sections 9.3 and 9.4 we elaborate on the validation of our prescriptive empirical model. We address the issue whether our model is in accordance with observations from reality, respecting the interpretive philosophy we adopted for this research (as explained in Subsection 2.3.1 on page 13).

Based on the comments given by subject matter experts and our experiences from the three prescriptive empirical models, in Section 9.5 (on page 187) we propose an improved model.

9.2 Reflection on the prescriptive empirical model

In this section we reflect on the prescriptive empirical model, with reference to the case studies Getronics Consulting, the Ministry of Housing, Spatial Planning, and the Environment, and Unilever Research & Development Vlaardingen (as described in Chapter 8 on page 127). We reflect on our prescriptive empirical model to examine whether organizations become more effective in knowledge sharing (i.e. does our model tally with the primary objective of this dissertation). We detail our reflection with respect to the identified enabling conditions, the assessment process of these conditions, and the suggested approach and resulting situation.

9.2.1 Observations with respect to enabling conditions

Due to the nature of our research — that can be described as a "dynamic nonlinear process with interactions between multiple units over time [that] complicates any observational research" (Miner and Mezias, 1996) — we cannot claim that we have a solid guarantee that we identified all conditions that enable knowledge sharing (as we argued in Section 5.6 on page 90). Nonetheless, we observed from the interviews we undertook in the three case studies that the 19 enabling conditions we identified do give an impression that through questioning their status a coherent image of the state of affairs with respect to knowledge sharing in an organization can be obtained.

No interviewee disputed even one of the conditions of having a relationship with knowledge sharing. Some interviewees affirmed an increased awareness about the relevance of some conditions for knowledge sharing. The enabling conditions we identified help organizations to become aware of requirements needed to create an environment in which people want to share their ideas, thoughts, and knowledge. We argue that the identification of possible influences on knowledge sharing helps organizations to appropriate these conditions as they seem fit, to recognize areas that need their attention, and to identify necessary steps for improvement, i.e. to become more effective in knowledge sharing.

9.2.2 Observations with respect to assessment of conditions

The assessment of the fulfillment of enabling conditions is largely based on the assessment and their justification as given by the employees in the interviews (i.e. in the case studies the Ministry of Housing, Spatial Planning, and the Environment, and Unilever Research & Development Vlaardingen cases) or it is based (in the Getronics Consulting case) on our experience as a long-term employee. Characteristic issues in epistemology that may have a potential distorting influence on our derived assessment are the following: selection of interviewees, number of interviews, quality of data, and consistency of data.

Selection of interviewees

It is apparent that great care should be taken to select the proper people to interview, for it is obvious that the selection of the (number of) interviewees influences the findings of the case study. The interviewees to be selected should have an understanding for knowledge sharing in general, they should have a thorough overview of knowledge sharing related issues in their organization, they should make up a fair representation of all types of employees, and they should speak for all organizational units involved.

Number of interviews

In the case studies the Ministry of Housing, Spatial Planning, and the Environment, and Unilever Research & Development Vlaardingen we respectively conducted 15 and 18 interviews. The results of these interviews lead us to propose that these numbers are adequate to obtain a comprehensible impression of the knowledge sharing situation in these organizations.

Quality of data

We judge the quality and reliability of the information that was brought forward in the interviews as satisfactory. The interviewees were open, frank, and critical about the knowledge sharing related developments in their organization. Generally, they showed a good overview of these developments and were able to reflect on this. We deliberately tried to avoid interviewer bias or contamination.

Consistency of data

We observed some discrepancies between the views given by different interviewees. These views are of course biased by the personal characteristics, whether people are comfortable with their work and their employer at the time of the interview, and a person's role in the organization. Because we did not perceive any profound contradictions, we consider this as a natural and human phenomenon.

9.2.3 Observations with respect to proposed stimulations

We think that the activities we proposed in our case studies to stimulate appropriate conditions allow these three organizations to become more effective in knowledge sharing,

which is the primary objective of this dissertation. Moreover, these activities are especially tailored to the — current and possible future — state of affairs with respect to knowledge sharing in the organization at hand.

In spite of this, when we reflect on the results of our recommendations we made to enhance knowledge sharing in the three case studies we must conclude that, in reality, these recommendations did not produce any significant results. Perhaps the recommendations are far too abstract, but in general, most organizations seem hesitant to endeavor on knowledge sharing programs whereas they are generally aware of the possible benefits. This may be called the knowledge sharing paradox — where people recognize that knowledge sharing is beneficial and valuable but they fail to realize this in practice.

What may cause this resistance? Stenmark (2001) observes: "People do not share knowledge without a strong personal motivation, and they would certainly not give it away without concern for what they may gain or lose by doing so." Using Groot (2001) we can identify other explanations: uncertain and vague revenues of knowledge sharing, lack of interest by management, people not willing to sacrifice their own interests, high costs, time pressure, and a focus on short term performance. Hanssen (2002) pinpoints this resistance to knowledge sharing as follows: "From talking with my colleagues and other folks involved in the adoption of systems where knowledge is created or distributed, the feeling is that they have either not done enough work to ensure that the initiative is targeting a deep pain in the organization, or they didn't take the culture of the organization sufficiently into account. … People have to feel that the initiative is addressing a problem that's affecting them personally. It's not enough to give them something that's good for the company at large, but that doesn't solve a problem that they have. It's really got to hit them at an individual or team level. … Also, the culture has to be open to receiving a different way of doing things. You have to consider training issues, reward systems, and human performance management. Many cultures promote competition as the way to get ahead. If that's the case, the last thing you would want to do is to take your idea and put it into a system where somebody else can build on it. … We have this paradox going on. People understand this at an intellectual level, but they always underestimate how powerful the behavioral and cultural forces are."

A good number of people in their professional life are conditioned for individuality and competition, not for collaboration and sharing (O'Dell and Jackson Grayson, 1997). Knowledge sharing demands that people start to think differently. Incentives are needed to accomplish that and management is in the position to provide these. Therefore commitment of management to cultivate an environment that is conducive to knowledge sharing is crucial, otherwise no change will take place. O'Dell and Jackson Grayson (1997) observe "as with change in most organizations, it is not essential that the leaders initially endorse it, only that they don't quash the pockets of innovation as they occur. But eventually, for it to blossom across the organization, management has to take an active, supportive role. This first requires that the leadership itself be convinced that [knowledge] transfer has merit and real impact." When management envisions no potential gain or lacks a sense of urgency to undertake or support knowledge sharing initiatives, no necessary changes will take place.

Knowledge sharing certainly created high hopes, but in general seems to fail to deliver in practice. In this respect we should bear in mind that knowledge sharing is a complex beast, just like any other rigorous organizational change program.

9.3 Method of validation

In this section we describe a method that we consider applicable to validate the prescriptive empirical model. We define validation as an assessment whether our model is in congruence with reality. In this process we have to bear the nature of the subject of our research in mind: in organizations multifaceted interactions — just like knowledge sharing — between people may influence behavioral change. We propose to use expert interviews for the validation of the prescriptive empirical model. These experts are subject matter professionals who are regarded as capable to form an accepted scientific opinion on our model. We argue that assessment by objective and knowledgeable people will result in improved insights and will enhance credibility of the model.

9.3.1 Objective of the expert interviews

The objective of the expert interviews is to develop consensus whether the prescriptive empirical model as described in this dissertation is an accurate representation of the real world. The expert interviews should provoke an analysis on the model and theory that were developed in our research:

- to validate the relation between model and reality;
- to identify limitations of the prescriptive empirical model; and
- to advise on possible improvements to the prescriptive empirical model.

9.3.2 Structure of the approach

We identified and selected the experts to be interviewed based on the following criteria: they are subject matter experts in the field of knowledge sharing, and there should be a balanced representation of academics and practitioners.

The experts selected were approached to ask for their participation. They were informed by letter about the objective of the expert interview. This letter also cited the questions to be asked (these questions are given in Subsection 9.4.1 on page 185). Accompanying the letter was a concise explanation of the prescriptive empirical model. This documentation was send at least three weeks prior to the interview to create an opportunity for the interviewees to review the model and prepare answers, comments, and recommendations.

The 16 expert interviews were held in January, February, and March 2002 with an average duration of about 75 minutes. These interviews were conducted by the researcher who took notes during the interview. The researcher transcribed these notes shortly after the interview and distributed them to the expert involved to review for accuracy. Modifications were processed, the result analyzed, and — when all interviewing had been done — combined with the findings from the other expert interviews. The final outcome is described in Section 9.4 of this dissertation, which was also distributed to the subject matter experts involved. The comments of the experts have been used to define an improved research model in Section 9.5 on page 187).

9.4 Validation of the prescriptive empirical model

9.4.1 Relation between model and reality

To test the validity of our model, the experts discussed and commented on the main constituents of the prescriptive empirical model. In correspondence with the objective of the expert interview, the discussion centered on the following questions, which are linked to the key constructs of the model:

- Are the 19 enabling conditions that we identified in this research, the most significant conditions that enable knowledge sharing?
- Is the breakdown into the knowledge sharing phases — as we introduced them in this research — in harmony with reality?
- Is it functional to make a distinction in the type of environment of an organization?
- Do the conditions belong to the knowledge sharing phases in the way as presented?
- Is the formula to indicate the level of knowledge sharing in alignment with practice?
- Do we define a proper ranking of the conditions?
- Are the numeric intervals of the knowledge sharing phases determined in a correct way?
- What do you consider as the limitations of this model?
- Can you identify improvements to the model?
- Will this model help organizations to become more effective in knowledge sharing?

The interviews were started with a brief explanation of the model. The questions enabled a structured walk-through of the key constructs of the model and ensured a correct understanding of the model. We gathered the comments of the subject matter experts per question and their observations are described below.

Question 1: Are the 19 enabling conditions that we identified in this research, the most significant conditions that enable knowledge sharing?

All interviewees considered these conditions as relevant to knowledge sharing. It is judged that they allow a good overview of the situation with respect to knowledge sharing in an organization. A number of experts commented that it is a step forward to designate conditions (i.e. to identify the 'control switches' or stimuli). Some experts assume there can be more enabling conditions existent than we have identified.

Other conditions that were suggested as relevant to knowledge sharing focus on the individual, group, and environment:

- facilitating the human being:
  increasing one's power, extending one's influence, intensifying one's passion, improving one's political antenna, raising one's income, enhancing one's service to the customer, and stimulating one's drive;
- stimulating group understanding and efforts:
  enabling collective ambition, creating shared context, reconciling age and sex differences, bridging geographical distances, ascertaining diversity, and imposing discipline (or stewardship or example behavior);
- linkage with the environment:
  creating benefits for the customer, retaining strategic focus (or linking the knowledge sharing strategy to the business strategy), and operational purposiveness.

Question 2: Is the breakdown into the knowledge sharing phases — as we introduced them in this research — in harmony with reality?

It is recognized by the experts that these phases will help in the awareness process (it may show organizations whether their intentions with respect to knowledge sharing have materialized yet). However, some subject matter experts lack an indication of the level of abstraction used (i.e. the scope), for it is deemed ambiguous to relate an identified knowledge sharing phase to a whole organization (because in general dissimilarities between organizational units exist).

The entity of which you want to identify the level of knowledge sharing development should be as small as possible. One interviewee related the names of the three 'middle' knowledge sharing phases to the technology factor, and that is not in line with the tenet of our theory as we propose people are essential and central to knowledge sharing.

Other observations made by the interviewees are the following:

- the knowledge sharing phases should be related to the business processes and the way of working in an organization;
- each type of organization may have its own sequence of knowledge sharing phases.

Question 3: Is it functional to make a distinction in the type of environment of an organization? (for a clarification on the relevance of this question and its ensuing activities, we refer to Subsection 9.5.2 on page 189)

We recognize two types of environment in which an organization operates: a stable or dynamic environment. Most subject matter experts perceive this distinction as simple and argue that this will not do justice to reality. Further, it will be difficult to determine *the* type of environment relevant to an organization, for more than one environment may be applicable (in the case of different business units for instance). Moreover, nowadays no environment is stable anymore. One expert proposed to use the terms 'relative slowly changing environment' and 'relative fast changing environment' instead.

According to several interviewees, possible influencing factors on the type of environment will be: trends in society, changes in market and industry, and developments initiated by oneself. In addition, different types of knowledge, their present and future value (i.e. half-life), and their alteration from one type to another are perceived to have an effect on the most convenient manner of knowledge sharing. Additionally the growth-phase, age, size, and geographical distribution of an organization also bear their influence.

Question 4: Do the conditions belong to the knowledge sharing phases in the way as presented?

All experts find it hard to answer this question. They consider the defined relations as logical and plausible, but propose more validation in order to increase the credibility of the model.

Question 5: Is the formula to indicate the level of knowledge sharing in alignment with practice?

Experts believe the calculation to indicate the level of knowledge sharing suggests an accurateness that — in this type of research — in reality does not exists. The input for this formula (the assessment values of enabling conditions) comes from interpreting the outcome of a limited number of interviews, which may create a subjective tendency. Furthermore, the trustworthiness of the weights or coefficients of the conditions will be enhanced through empirical research.

It is advised by the interviewees to keep mathematics for this field of study as simple as possible. This implies concentrating on the most critical conditions or aggregating them to obtain a limited number of parameters.

Question 6: Do we define a proper ranking of the conditions?

Each expert agrees that a certain difference in weights exists, but it is argued by some that a ranking of conditions is dependent on the situation at hand and on mutual influences. They suggest trying to define these influencing stimuli through experiments and experiences in practice.

Question 7: Are the numeric intervals of the knowledge sharing phases determined in a correct way?

An answer to this question could not be given by anyone for this demanded a particularly thorough and detailed understanding of the model at hand.

9.4.2 Limitations and possible improvements of the theory

Our prescriptive empirical model is considered by the subject matter experts to be holistic, but applicability in practice could be improved by taking specific characteristics of different type of organizations into account. In addition, the relations between the enabling conditions and the knowledge sharing phases, as well as the ranking of the conditions can benefit from more empirical justification.

The experts observe that an improvement will be to study the mutual dependencies between conditions. Another enhancement may be to determine which activities to undertake to stimulate knowledge sharing based on more qualitative and less quantitative arguments. The establishment of a relation between the activities proposed and solving current organizational problems — this should also be interpreted as, for example, improving service to the customer — is seen as an added value of the model. It is assumed that it can be helpful to describe these proposed activities in more detail (costs, benefits, risks, impact, long or short term, resources needed etc): to transform from a model for assessment into a model for change and growth. Some experts presume that to include also the usage of knowledge, besides the sharing of knowledge as is done now, will add value to the model.

In general, the consulted experts judge the model as able to pinpoint organizational weak spots in the facilitation of knowledge sharing. They consider the model as an aid to grow awareness about the contribution of knowledge sharing to the goals of the organization. They underline that the activities proposed to stimulate knowledge sharing ought to be clear, unambiguous, and actionable to be of practical value. The validity of the accurateness of these activities demands a broad deployment in actual practice.

9.5 An improved prescriptive empirical model

This section holds an improved prescriptive empirical model, derived from the comments made by the subject matter experts and our experiences from the three prescriptive empirical models.

We present our improved model through its key constructs and their alteration: the enabling conditions, the knowledge sharing phases and knowledge sharing strategy, the repeating process of assessment and action, and suggested approach.

9.5.1 Enabling conditions

The conditions that some subject matter experts considered also relevant to knowledge sharing (as mentioned in Section 9.4 on page 185) lead to the following adaptation of the overview of enabling conditions as shown in Figure 9.1 below.

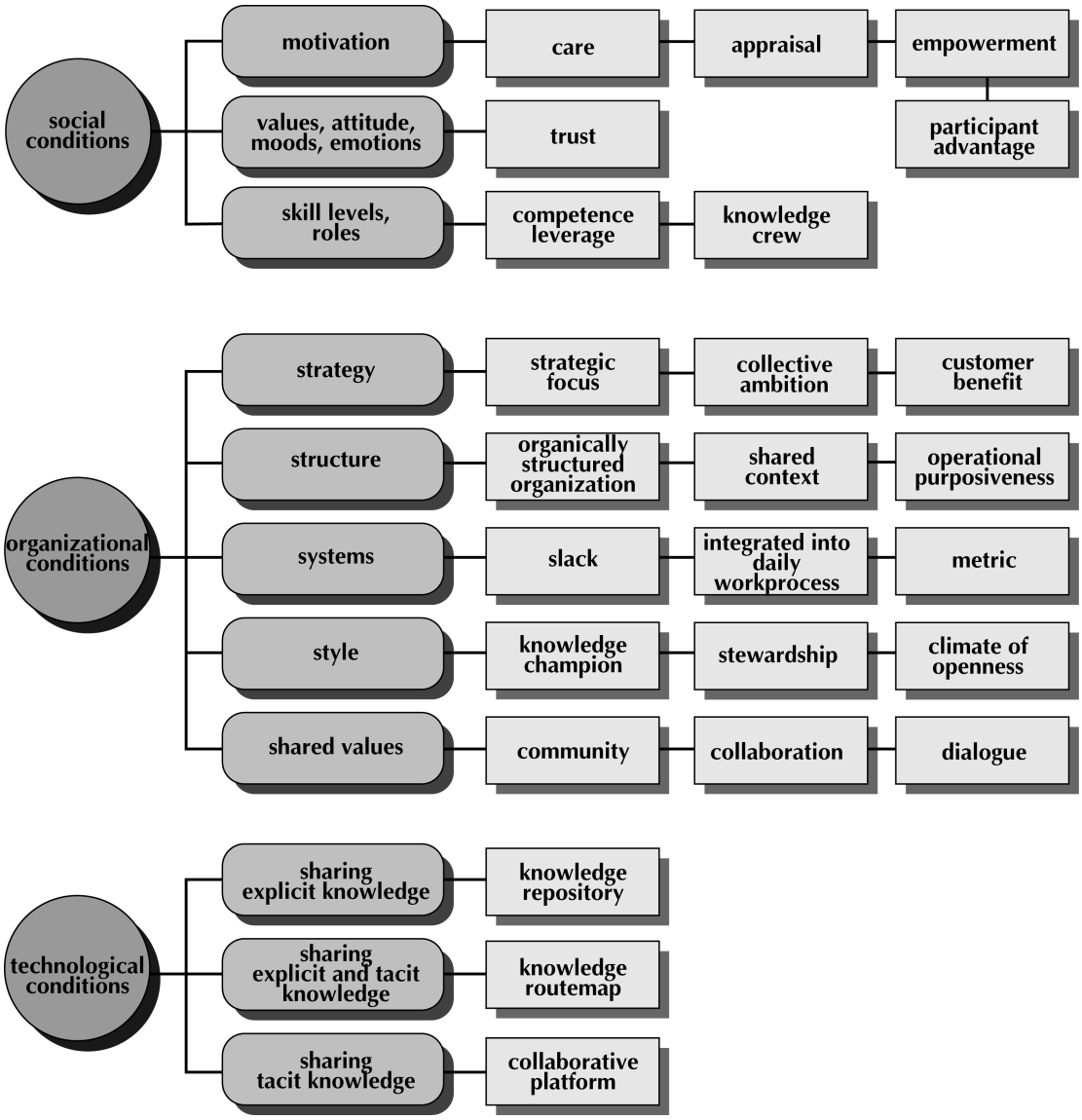


Figure 9.1: Adapted overview of social, organizational, and technological conditions

Compared to the enabling conditions defined in Chapter 5 (on page 65) the following has changed: *participant advantage* is a social condition that has been added to indicate the 'What is in it for me' factor. Knowledge sharing programs do have to offer some kind of advantage to their participants to secure their cooperation.

In the organizational conditions *learning organization* has been replaced by *strategic focus*. The knowledge sharing strategy and its efforts should tally with the overall organizational strategy, there has to be an apparent fit between these two strategies for the best results (Hansen et al., 1999).

Furthermore, five new organizational conditions have been added: *collective ambition* (what people want to achieve or attain together, in a somewhat emotional undertone), *customer benefit* (knowledge sharing activities have to serve a purpose: for example to response faster to customer inquiries or to improve customer handling), *shared context* (when people do not understand each other, no knowledge will be shared, for interpretation of knowledge is context specific (Davenport et al., 1998a; Nonaka and Takeuchi, 1995; Elliott, 1996)), *operational purposiveness* (knowledge sharing activities will be encouraged when they help to solve an organizational problem), and *stewardship* (the conduct of management sets a clear example on knowledge sharing behavior that is desired by the organization).

9.5.2 Knowledge sharing phases and knowledge sharing strategy

We feel no pressing necessity to adapt our defined knowledge sharing phases: the unawareness, knowledge repository, knowledge routemap, collaborative platform, and organizational learning phase; for they can provide — in our opinion — a fair indication of the level of development with respect to knowledge sharing in an organization.

Because most subject matter experts perceive the distinction in a stable or dynamic environment to indicate the type of environment in which an organization operates justly as (too) simple we decided to amend this. We refined our theory by considering the strategy to realize knowledge sharing. Therefore in Section 6.8 (on page 101) we introduced and described two possible knowledge sharing strategies: the codification strategy and the personalization strategy (Hansen et al., 1999), and adapted our text correspondingly.

We did not change the relations between the knowledge sharing phases and their most appropriate enabling conditions as listed in Table 6.3 (on page 111), but in this table we attempted to strengthen our arguments.

9.5.3 A repeating process of assessment and action

Due to the comments of the subject matter experts that the calculation to indicate the level of knowledge sharing suggests an accurateness that for this type of research in reality does not exists, we moved this instrument to Appendix D (on page 227) to decrease its relevance.

It was remarkable that most interviewees in the three case studies did not assess any condition lower than 5 on a scale from 1 until 10 (even when it was evident that such a condition was not present at all). We suppose they display this behavior to 'protect' their organization from losing face. Therefore we propose that the assessment of enabling conditions should not fall in an interval between 1 and 10, but to use a perhaps more 'neutral' interval such as [A, B, C, D, E] to specify a completely fulfilled, a sufficient

fulfilled, a mediocre fulfilled, an unsatisfactory fulfilled and a not present condition. In arithmetic's these letters can be projected unto the values 10, 7.75, 5.5, 3.25, and 1.

Another improvement may come from creating a shared context when assessing the enabling conditions. Interpretation of what is meant by a condition may be helped when one or two examples are available that give a good indication of the idea behind the condition, are well-known by the employees, and are specific for the organization at hand.

The process of assessment and action is unchanged: first decide which knowledge sharing strategy is relevant; assess the degree of fulfillment of all enabling conditions; indicate the level of knowledge sharing; determine which knowledge sharing phase is applicable; determine to enhance the current phase or to facilitate a transition into the next knowledge sharing phase; select which conditions are most appropriate to stimulate; and correlate current problems with relevant trends to determine the most viable way to realize these stimulations.

9.5.4 Suggested approach

The approaches we proposed in the three case studies to implement our suggestions for improvement of knowledge sharing did not result in any substantial action taken by these organizations. The question arises why organizations, that realize the gains and advantages to be obtained through knowledge sharing (or say they do), do not come into action when a number of rational, specific measurements are brought forward to them. In Subsection 9.2.3 (on page 182) we gave possible explanations for this, in this subsection we will focus on ways to make our suggested approach more effective.

In Subsection 9.5.1 (on page 188) we recognized that knowledge sharing has to offer tangible advantages to participants of knowledge sharing programs. In our suggested approaches, we dealt with organizational problems in a rather global way. To improve our prescriptive empirical model we need more focus on solving problems in the daily operations — in correspondence with the possible improvements that were suggested by the consulted experts in Subsection 9.4.2 (on page 187). This implies identifying three to four problems that cause the most pain and which can be solved relatively straightforward by applying knowledge sharing techniques. Another enhancement comes from appointing sponsors — who have sufficient organizational power to accomplish the activities proposed — from those that benefit most in solving these problems.

9.6 Conclusion

In this chapter we evaluated our prescriptive empirical model using our experiences from the three case studies and through a number of subject matter expert interviews. This resulted in the description of an enhanced prescriptive empirical model. This will enable improved insight into conditions related to knowledge sharing in an organization.

In the next, final chapter of this dissertation we evaluate the research, we suggest issues that may be subject of future research, and we conclude our research.

10 EVALUATION OF THE RESEARCH AND CONCLUSION

The more extensive a man's knowledge of what has been done,
the greater will be his power of knowing what to do.
Benjamin Disraeli

In the first section of this chapter we present our evaluation of the research. Based on our findings, we propose directions for future research in the second section. The final section holds our conclusion of the research.

10.1 Evaluation of the research

We evaluate our research by considering whether we realized our research goal, by examining the outcome and possible significance of our research, and by reflecting on the research approach used.

10.1.1 Realization of the research goal

In Section 2.2 (on page 12) our research goal is defined as follows:

"Identify the relevant conditions and enablers
that facilitate knowledge sharing between people in an organization."

In Chapter 3 (on page 21) we described the following organizational knowledge sharing processes: creating knowledge — tacit-to-tacit, tacit-to-explicit, explicit-to-explicit, explicit-to-tacit —, valuation of new explicit knowledge, organizing and classifying assessed explicit knowledge, storing structured explicit knowledge, maintaining and refining stored explicit knowledge, distributing stored explicit knowledge, accessing stored explicit knowledge, using explicit knowledge, and using tacit knowledge.

The social, organizational, and technological conditions that enable these knowledge sharing processes were identified in Chapter 5 and Section 9.5.1 (on page 65 and 188 respectively) as:

social: care, trust, empowerment, competence leverage, appraisal, knowledge crew, and participant advantage;

organizational: climate of openness, dialogue, community, organically structured organization, collaboration, strategic focus, slack, knowledge champion, system integrated into daily workprocess, metric, collective ambition, customer benefit, shared context, operational purposiveness, and stewardship;

technological: knowledge repository, knowledge routemap, and collaborative platform.

In Chapter 6 (on page 91) we presented phases that indicate the level of development with respect to knowledge sharing in an organization: the unawareness phase, knowledge repository phase, knowledge routemap phase, collaborative platform phase, and organiza-

tional learning phase. We also introduced the knowledge sharing strategy that an organization may use: a codification strategy or a personalization strategy.

The relation between these strategies, their knowledge sharing phases, and their enabling conditions was detailed in Section 6.9 (on page 102). Because this relation identifies the relevant conditions and enablers that facilitate knowledge sharing between people in an organization, we may contend that the research goal is realized.

In Chapter 7 (on page 113) we described a repeating process of assessment and action that may provide customized, pragmatic, actionable advice to improve knowledge sharing in an organization. Such a process leads to identification of the conditions that are most appropriate to stimulate and the most viable way to effectuate these stimulations. The effect of these stimulations on the enabling conditions can subsequently — in another process of assessment and action — be assessed, and may thus help in evaluating whether the level of knowledge sharing has changed and in steering efforts to share knowledge. We consider this in accordance with the primary objective of our dissertation (as addressed in Section 1.5 on page 9): to help organizations to become more effective in knowledge sharing.

10.1.2 Outcome of the research

With respect to the outcome of the research some issues warrant closer examination and need contemplation.

- Do the conditions belong to the knowledge sharing phases in the way that we presented them (in Table 6.3 on page 111)? A related issue is whether the sequence of the conditions as we listed them in the matrix-cells is indeed the correct sequence?

  The positioning and sequencing of the conditions is based on the arguments that we described in our justification. Unfortunately, we know of no theory that may be applied to validate whether these arguments hold. Therefore, only a validation in practice may yield answers to these two questions.
- Is it advisable for organizations to go through all phases and reach the 'ultimate' or organizational learning phase, no matter what costs are incurred?

  We think that there always should be a balance between effort and (perceived) result. The objective of our distinction in knowledge sharing phases is that it should not be a straitjacket but a means to get an indication of possible progress with respect to knowledge sharing.
- Do we apply the proper argumentation when we define in Appendix D (on page 227) the ranking of the conditions? Is it logical to make use of an ordinal scale when ranking the conditions? Are the intervals of the knowledge sharing phases determined in a correct way? Do we define the thresholds in a realistic manner?

  We introduced ranking because we feel that some conditions are more important to knowledge sharing than others. To our knowledge, arguments to define this ranking can not be supplied by existing theory. Therefore we conceived a line of reasoning with the objective of finding a satisfactory sequence in the enabling conditions. This reasoning was extended to allow us to determine the level of development in an organization with respect to knowledge sharing.

- Is the assessment of the fulfillment of the enabling conditions always executed in a subjective manner? If so, can you prevent that a personal bias slips into this process?

  In our method assessment always takes place in a subjective way and this obviously will harm objectivity. Regrettably, we know of no objective way to give an assessment value to these conditions that will hold in our circumstances. Nevertheless we contend that when this assessment is done in the same way by the same people for some time, it will cancel out any possible personal bias and will bring a viable means for measurement of phenomena that are neither directly observable nor easily discernible (Lee, 1989).
- What is the added value of the suggestions on how to stimulate a condition?

  We consider competent stimulation of conditions as one of the most complex elements of knowledge sharing. We also recognize that every organization is different. Therefore, for most conditions we list (in Section 7.6 on page 120) several possible ways to assist organizations in the stimulation of conditions. We do not mean this as a blueprint but more as an incentive to generate other ways of stimulation that may fit the organization at hand better or that are more in line with the present situation (so that change is not too extreme).

We suggest that application of our prescriptive empirical model on a wide scale will result in improvements of the theory and may help in addressing some of the above mentioned issues. This may help further to determine whether the social, organizational, and technological conditions — as identified and presented in this research — indeed play a role in the facilitation of knowledge sharing in an organization. Empirical evidence may also show whether stimulation of some conditions produce more effect than stimulation of others. It also may indicate the type of stimulation that proves to be most effective and whether or not this is related to the sort of organization at hand. More insight may be acquired about the (effects of) interactions between the different enabling conditions or about the best sequence in which stimulations should take place. Extensive empirical data may show a different relation between a knowledge sharing phase and its most appropriate conditions, it may yield a better method for assessment of the conditions, or it can fine tune the relative importance of these conditions.

The main outcomes from our research can be summarized as follows, it offers:

- a contribution to the understanding of the requirements for knowledge sharing in organizations and an improved insight into the processes involved in sharing of tacit and explicit knowledge;
- the identification of conditions that facilitate knowledge sharing in an organization and the definition of phases that reflect a certain stage in the development of knowledge sharing in an organization;
- the description of a repeating process of assessment and action that identifies customized activities to enhance knowledge sharing in an organization.

10.1.3 Significance of the research

The outcome of this thesis, as defined in the previous section, offers both theoretical and practical contributions to organizational research and theories of knowledge management. Our study builds on a synthesis of the theories of Nonaka and Takeuchi (1995) and Orlikowski (1992). This resulted in an elaboration on the knowledge sharing processes that may exist in an organization, an explanation of the three entities people, organization, and

(information and communication) technology and their role in knowledge sharing, and an examination of the relationship between these processes and entities.

Theoretical understanding of knowledge sharing may be enhanced through our identification of social, organizational, and technological conditions that influence knowledge sharing processes in an organization. Additionally, our research refines the understanding about the role these conditions play by explicating their relation with the possible stages that may arise in an organization — under different types of strategy — with respect to the development of knowledge sharing. Furthermore, the process of assessment and action we defined offers insight into an appropriate approach to assess and improve the level of knowledge sharing in an organization.

The practical application of our research may be considered twofold. First, it enables us to assess the current state of knowledge sharing for an organization, identifies which enabling conditions are most suitable to stimulate, and it suggests the optimal manner to enhance these conditions. Second, it offers a diagnostic technique that facilitates a deeper understanding of the effectiveness of actions taken to stimulate knowledge sharing.

10.1.4 Reflection on the research approach

The research approach we used consisted of a research principle, a research strategy, and a research instrument (as described in Chapter 2 on page 11). Our research principle followed the interpretive philosophy, which proved to be appropriate to the explorative nature of our study.

The steps in the inductive-hypothetical model cycle, which we chose as our research strategy, provided firm guidance for our research. The inductive-hypothetical model cycle enabled us to focus on the research question, it steered us to investigate both theoretical and practical issues, and it helped to distinguish between descriptive and prescriptive aspects. This research strategy corresponded satisfactory with the objective of the research approach as expressed in Section 2.1 (on page 11): “Our research approach focuses on theory building with a practical value: it aims to be general, applicable, and understandable.”

The case study research was chosen as our research instrument. Our case studies allowed us to glean factors that are relevant to knowledge sharing in practice and helped us to validate the theory. As we remarked in Subsection 2.3.3 (on page 15) a weakness of this instrument is that conclusions may be derived from limited empirical data that do not hold in general. To counter this weakness we conducted a number of expert interviews to validate our findings, which in addition were compared to theories found in related literature.

10.2 Directions for future research

Our research is one step in the complex process to understand knowledge sharing and its stimuli. Additional steps need to be taken to create more insight. This section suggests possible directions for future research. These directions are a continuation and extension of our research.

Because we only could investigate a relatively small number of case studies, more insight and improvement of the theory will be created through obtaining further empirical data on our theory about knowledge sharing. It will be very desirable to monitor organizations, which apply our theory, for some time to cumulate experiences. Further study is needed to examine the relationships between certain knowledge sharing enabling conditions and the characteristics of organizations and their strategies to test their generalizability. Surveys can be employed to gain a better insight in practical experiences with (conditions that enable) knowledge sharing. Comparisons or bench-marking between different types of organizations or industries may yield more specific empirical data that may lead to a refinement of the theory for different organizational structures and environments.

Directions for future research — related to the outcome of our research as summarized in Subsection 10.1.2 on page 192 — are suggested according to three key outcomes: the knowledge sharing processes, enabling conditions, and making results of stimulations more tangible.

Knowledge sharing processes

Further research with respect to the knowledge sharing processes we identified may examine the interactions and relationships between these processes. Can we create more insight by detailing these processes, such as the definition of a 'ranking technique' to valuate new explicit knowledge? Are there perhaps other processes — like for instance a process that supports sense making — relevant for knowledge sharing? Does every organizational unit (with its own culture) define knowledge sharing differently and how do we achieve collective understanding? What type of person absorbs the concept of knowledge sharing best, what type of organization facilitates knowledge sharing best, and what level of technological sophistication works best?

Enabling conditions

With respect to further research we observe that empirical evidence may also show whether stimulation of some conditions produce more effect than stimulation of others. Empirical data may also indicate the type of stimulation that proves to be most effective and whether this is related to the sort of organization and its type of environment.

Making results of stimulations more tangible

Research into ways to pinpoint expected qualitative and quantitative benefits of the selected stimulations may help to make the results of the efforts to be undertaken more tangible. This may be of assistance in justifying the needed investments.

10.3 Conclusion

This concluding chapter evaluated our research and offered suggestions for future research. We contended that we realized our research goal and we summarized the main results of our study.

We wrote in Chapter 2 (on page 11): "Knowledge sharing is about stimulating the exchange of experiences, ideas, and thoughts between people. Organizations can create and sustain an environment that encourages knowledge sharing, i.e. they can provide for conditions that enable such an environment." We contended in Subsection 9.2.3 (on page 182) that in spite of the perceived benefits of knowledge sharing to people and organizations, for the greater part knowledge sharing programs fail to deliver the anticipated returns.

Therefore we defined the primary objective of this dissertation to help organizations to become more effective in knowledge sharing by identifying and understanding conditions that may facilitate knowledge sharing. We emphasize that knowledge sharing is a complex beast influenced by numerous factors. It would be oversimplifying reality to claim there is one particular remedy. In our research we discovered an integrated framework of conditions relevant for knowledge sharing. We suggest facilitation of knowledge sharing should take place in a repeating process of assessment and stimulation of these conditions. We claim that knowledge sharing between people in an organization is embedded in the way of thinking and in the way of working, and that it can be enabled by stimulating the right social, organizational, and technological conditions.

A REFERENCES

ADLER, P.S. & COLE, R.E., "Designed for Learning: A Tale of Two Auto Plants", *Sloan Management Review*, pp. 85-94, Spring 1993.

ALAVI, M. & LEIDNER, D., "Knowledge Management Systems: Emerging Views and Practices from the Field", *Proceedings of the 32nd Hawaii International Conference on System Sciences*, IEEE Computer Society Press, 1999.

ALLEN, J. & ALLEN, R.F., *A Sense of Community, a Shared Vision, and a Positive Outlook: Key Enabling Factors in Successful Culture Change*, URL http://www.healthyculture.com/Articles/Triangle.html, accessed January 2002, 1990.

ANDERSON, M., "Intranets and the Electronic Workplace Scenario", *Proceedings Gartner Group Symposium ITxpo97*, Cannes, 1997.

ANDERSON, M. & SMITH, C., *Intranets and the Electronic Workplace Scenario: Virtualizing the Office*, Strategic Analysis Report R-06-4451, Gartner Group, 1998.

ANDRIESSEN, J.H.E. (editor), *Dynamics of Knowledge Sharing Communities: An Overview*, Telematica Instituut, Enschede, February 2001.

ASKME CORPORATION, *Knowledge Chain Management: Value Chain Acceleration through Optimized Knowledge Flows*, White Paper, URL http://www.askmecorp.com/Knowledge-Chain-Management.pdf, accessed August 2001, 2001.

APQC, *Embedding KM: Creating a Value Proposition*, URL http://old.apqc.org/free/articles/dispArticle.cfm?ProductID=1367, accessed April 2003, May 2001.

BACK, C., *Nota Kennismanagement VROM*, Internal publication Ministry of Housing, Spatial Planning, and the Environment of the Netherlands, The Hague, May 2001.

BAIR, J., "Knowledge Management", *Proceedings Gartner Group Symposium ITxpo97*, Cannes, 1997.

BAIR, J. & HUNTER, R., *Introducing the KM Project Viability Assessment*, Research Note SPA-03-5005, Gartner Group, 1998.

BAKOS, J.Y. & TREACY, M.E., "Information Technology and Corporate Strategy: A Research Perspective", *MIS Quarterly*, Vol. 10, No. 2, pp. 107-119, June 1986.

BALASUBRAMANIAN, V., *Organizational Learning and Information Systems*, URL http://www.eies.njit.edu/~333/orglrn.html, accessed November 1997, 1996.

BASKERVILLE, R., *Deferring Generalizability: Four Classes of Generalization in Social Enquiry*, URL http://iris.informatik.gu.se/sjis/magazine/vol8no2/BASKER~1.htm, accessed August 2000, 2000.

BEATH, C.M., "Supporting the Information Technology Champion", *MIS Quarterly*, Vol. 15, No. 3, pp. 355-372, September 1991.

BELLINGER, G., *Knowledge Management — Emerging Perspectives*, URL http://www.outsights.com/systems/kmgmt/kmgmt.htm, accessed April 1998, 1998.

BENBASAT, I., GOLDSTEIN, D.K. & MEAD, M., "The Case Research Strategy in Studies of Information Systems", *MIS Quarterly*, Vol. 11, No. 3, pp. 369-386, September 1987.

BERNBOM, G., "The Information Professions and Enterprise-Wide Information Strategies", *Cause/Effect*, Vol. 19, No. 3, pp. 4-5, Fall 1996.

BERNBOM, G., "Institution-Wide Information Strategies", *Cause/Effect*, Vol. 20, No. 1, pp. 8-11, Spring 1997.

BLADEL, R.J.E.M. VAN, NAGTEGAAL, A. & VERHALLEN, TH.J.W., *The Learning Organization or Organizational Knowledge Creation*, MBA/MBI Assignment, Erasmus Universiteit Rotterdam, 1997.

BOCK, W., *Intranet Corner: Knowledge Management 101*, URL http://www.intranetjournal.com/articles/200011/ic_11_29_00a.html, accessed July 2002, 2000.

BONO, E. DE, *Lateral Thinking*, Penguin Books, London, 1990.

BONTIS, N., "There's a Price on your Head: Managing Intellectual Capital Strategically", *Business Quarterly*, pp. 41-47, Summer 1996.

BOONE, P.F., *Managing Intracorporate Knowledge Sharing*, Eburon Publishers, Delft, 1997.

BOUTHILLIER, F. & SHEARER, K., *Understanding Knowledge Management and Information Management: The Need for an Empirical Perspective*, URL http://informationr.net/ir/8-1/paper141.html, accessed November 2002, *Information Research*, Vol. 8, No. 1, October, 2002.

BRINK, P. VAN DEN, "Measurement of Conditions for Knowledge Sharing", *Proceedings 2nd European Conference on Knowledge Management*, Bled, November 2001.

BROCKWAY, D.W., "Knowledge Technologies and Business Alignment", *Information Management & Computer Security*, Vol. 4, No. 1, pp. 45-46, 1996.

BROWN, J.S. & DUGUID, P., "Organizational Learning and Communities-of-Practice: Toward a Unified View of Working, Learning and Innovation", *Organization Science*, Vol. 2, No. 1, pp. 40-55, 1991.

BROWN, S.A., *Knowledge, Communication, and Progressive Use of Information Technology*, Thesis, University of Minnesota, 1997.

BÜGEL, J., "Kennismanagement, de Nieuwe Obsessie", *Intermediair*, Vol. 33, No. 24, pp. 151-153, June 1997.

CABRERA, A., *Making Sharing Good for All*, URL http://globalarchive.ft.com/globalarchive/articles.html?id=001002001289, accessed July 2001, Financial Times, October 2, 2000.

CASONATO, R., "Knowledge Management Drivers", *Proceedings Gartner Group Symposium ITxpo98*, Cannes, 1998.

CHIZMAR, J.F. & WILLIAMS, D.B., "Altering Time and Space through Network Technologies to Enhance Learning", *Cause/Effect*, Vol. 19, No. 3, pp. 14-21, Fall 1996.

CHOO, CHUN WEI, *Information Management for the Intelligent Organization*, URL http://choo.fis.utoronto.ca/fis/imio, accessed September 1997, 1995.

CHOO, CHUN WEI, "The Art of Scanning the Environment", *Information Today / Learned Information*, Medford, New Jersey, 1995a.

CHOO, CHUN WEI, *The Knowing Organization: How Organizations Use Information to Construct Meaning, Create Knowledge, and Make Decisions*, Oxford University Press, New York, 1998.

CHRISTOPH, N., VAN DER TANG, F. & DE HOOG, R., "Intuitive Knowledge Management Strategies", *Proceedings 2nd European Conference on Knowledge Management*, Bled, November 2001.

COHEN, M.D., "Individual Learning and Organizational Routine: Emerging Connections", *Organization Science*, Vol. 2, No. 1, pp. 135-139, February 1991.

CONLON, K., "The Shape of the Future", *Unilever Magazine*, Third issue, No. 121, pp. 30-33, 2001.

COOPER, R.B. & ZMUD, R.W., "Information Technology Implementation Research: A Technological Diffusion Approach", *Management Science*, Vol. 36, No. 2, pp. 123-139, February 1990.

CORNELIS, M., "De KLu als lerende organisatie: een tussenstand", *Militaire Spectator*, Vol. 167, No. 2-98, pp. 75-85, February 1998.

CROSS, R., PARKER, A. & PRUSAK, L., *Knowing What We Know: Supporting Knowledge Creation and Sharing in Social Networks*, White Paper, IBM Institute for Knowledge Management, URL http://openacademy.mindef.gov.sg/OpenAcademy/Central/HTML%20Folder/KM/bcp/downloads/IKM_Knowing_What_We_Know_White_Paper_08-00.pdf, accessed January 2002, August 2000.

CURRIE, A.P., "World Bank Sees Value in Becoming an Internal, External 'Knowledge Bank'", *Knowledge Management in Practice*, No. 7, pp. 1-8, April-May 1997.

DAFT, R.L. & WEICK, K.E., "Toward a Model of Organizations as Interpretation Systems", *Academy of Management Review*, Vol. 9, No. 2, pp. 284-295, 1984.

DARLING, M.S., "Building the Knowledge Organization", *Organization Science*, Vol. 2, No. 1, pp. 40-55, 1991.

DAVENPORT, T.H., "Saving IT's Soul: Human-Centered Information Management", *Harvard Business Review*, pp. 119-131, March-April 1994.

DAVENPORT, T.H., "We have the techknowledgy", *CIO*, Vol. 9, No. 21, pp. 36-38, Sept. 15 1996.

DAVENPORT, T.H. & PRUSAK, L., *Know What You Know: Learn How Valuable Corporate Knowledge is Acquired, Created, Bought, Sold and Bartered*, URL http://www.brint.com/, accessed April 1998, 1998.

DAVENPORT, T.H., LONG, D.W. DE & BEERS, M.C., "Successful Knowledge Management Projects", *Sloan Management Review*, Vol. 39, No. 2, pp. 43-57, Winter 1998a.

DAVIS, M.C., "Knowledge Management", *Information Strategy: The Executive's Journal*, Vol. 15, No. 1, pp. 11-22, Fall 1998.

DE BONO, E. *see* BONO, E. DE.

DE GEUS, A. GEUS, A. DE.

DE GROOT, S. *see* GROOT, S. DE.

DE LONG, D.W. *see* LONG, D.W. DE.

DE VREEDE, G.J. *see* VREEDE, G.J. DE.

DENNING, S., *What is Knowledge Management?; A Background Document to the World Development Report*, White Paper, World Bank, 11 October 1998.

DENNING, S., *Incentives and Accountability Structures*, URL http://groups.undp.org/km-strategy/documents/docs/Incentives_and_Accountability_Structures.pdf, accessed July 2001, February 2001.

DIAMOND, J., *Guns, Germs and Steel: A Short History of Everybody for the Last 13,000 Years*, Vintage, London, 1998.

DIXON, N.M., *Common Knowledge: How Companies Thrive by Sharing What They Know*, Harvard Business School Press, Boston, Massachusetts, 2000.

DRUCKER, P.F., "The Coming of the New Organization", *Harvard Business Review*, pp. 45-53, January-February 1988.

DRUCKER, P.F., "The Future That Has Already Happened", *Harvard Business Review*, pp. 20-24, September-October 1997.

DUFFY, J., "Collaborative Computing, Groupware and Knowledge", *Information Management & Computer Security*, Vol. 4, No. 2, pp. 39-41, 1996.

EDVINSSON, L., "Developing Intellectual Capital at Skandia", *Long Range Planning*, Vol. 30, No. 3, pp. 366-373, June 1997.

EDWARDS, M., "Organizational Learning in Non-Governmental Organizations: What Have We Learned?", *Public Administration and Development*, Vol. 17, pp. 235-250, 1997.

EISENHARDT, K.M., "Building Theories from Case Study Research", *Academy of Management Review*, Vol. 14, No. 4, pp. 532-550, 1989.

ELEVELD, R., "Internet: van 'Pull' naar 'Push': Nieuwe Informatievoorziening op het Internet", *Technieuws*, Vol. 35, No. 9, pp. 4-13, 1997.

ELLIOTT, S., "APQC Conference Attendees Discover the Value of a Successful KM Program", *Knowledge Management in Practice*, No. 5, pp. 1-8, 1996.

ELLIOTT, S., "Arthur Andersen Maximizes Its Core Commodity Through Comprehensive Knowledge Management", *Knowledge Management in Practice*, No. 9, pp. 1-8, August-September 1997.

ELLIOTT, S. (editor), *Using Information Technology to Support Knowledge Management*, American Productivity & Quality Center, Houston, 1997a.

EVERS, K.E., "The Trans-theoretical Model of Behavior Change: Evidence Based Policy and Practice", *Proceedings 'Oxford' International Conference on Education and Development,* Oxford, 2001.

FAHEY, L. & PRUSAK, L., "The Eleven Deadliest Sins of Knowledge Management", *California Management Review*, Vol. 40, No. 3, pp. 265-276, Spring 1998.

FIOL, C.M. & LYLES, M.A., "Organizational Learning", *Academy of Management Review*, Vol. 10, No. 4, pp. 803-813, 1985.

GARVIN, D.A., "Building a learning organization", *Harvard Business Review*, pp. 78-91, July-August 1993.

GEPHART, M.A., MARSICK, V.J., VAN BUREN, M.E. & SPIRO, M.S., "Learning Organizations Come Alive", *Training & Development*, pp. 35-45, December 1996.

GERSHMAN, A. & GOTTSMAN, E., "Use of Hypermedia for Corporate Knowledge Dissemination", *Proceedings of the Twenty-Sixth Hawaii International Conference on System Sciences '93*, IEEE Press, CA, Vol. 3, pp. 411-420, 1993.

GEUS, A. DE, *The Living Company. Growth, Learning and Longevity in Business*, Nicolas Brealey Publishing Ltd, London, 1997.

GLYNN, M.A., "Innovative Genius: A Framework for Relating Individual and Organizational Intelligences to Innovation", *Academy of Management Review*, Vol. 21, No. 4, pp. 1081-1111, 1996.

GROOT, S. DE, "Kennismanagement in Veranderkundig Perspectief", *KM 2001*, No. 1, pp. 10-15, 2001.

GRATTON, L., HOPE-HAILEY, V., STILES, PH. & TRUSS, C., "Linking Individual Performance to Business Strategy: The People Process Model", *Human Resource Management*, Vol. 38, No. 1, pp. 17-31, Spring 1999.

GRAY, P.H., "A Problem-solving Perspective on Knowledge Management Practices", *Decision Support Systems and Electronic Commerce*, Vol. 31, No. 1, pp. 87-102, May 2001.

HAMEL, G. & PRAHALAD, C.K., *De Strijd om de Toekomst; Baanbrekende Strategieën voor Marktleiderschap en het Creëren van Nieuwe Markten (Competing for the Future; Breakthrough Strategies for Seizing Control of Your Industry and Creating the Markets of Tomorrow)*, Scriptum Books, Schiedam, 1994 (Harvard Business School Press, 1994).

HANSEN, M.T., NOHRIA, N. & TIERNEY, TH., "What's Your Strategy for Managing Knowledge?", *Harvard Business Review*, pp. 106-116, March-April 1999.

HANSEN, M.T., "Knowledge Networks: Explaining Effective Knowledge Sharing in Multiunit Companies", *Organization Science*, Vol. 13, No. 3, pp. 232-248, May-June 2002.

HANSSEN, D., *Things We Think: The Chief Knowledge Officer as a Source of Business Value — An Interview With Chris Newell*, URL http://www.viant.com/pages2/downloads/twt_km_interview.pdf, accessed June 2002, 2002.

HARRIS, K., "KM: Making It Happen", *Proceedings Gartner Group Symposium ITxpo99*, Cannes, 1999.

HARTZ, C., SAMMIS, S., HOFER-ALFEIS, J., LOPEZ, K., RAYBOURN, C. & NEUMANN WILSON, J., *Measurement for Knowledge Management*, APQC, URL http://www.apqc.org/free/articles/dispArticle.cfm?ProductID=1307, accessed February 2001, 2001.

HAUSCHILD, S., LICHT, T. & STEIN, W., "Creating a Knowledge Culture", *The McKinsey Quarterly*, No. 1, pp. 74-81, 2001.

HEIJST, G. VAN & KRUIZINGA, E., *Kennisinfrastructuur: De Ruggengraat van Lerende Organisaties*, Kenniscentrum CIBIT, Utrecht, 1996.

HENDRIKS, P.H.J., HAKET, F.H.M., PIETERSEN, P.M. & SMAKMAN, M.A.R.C.U., "Kennistechnologie als Instrument voor Kennismanagement", *Bedrijfskunde*, Vol. 69, No. 1, pp. 87-94, 1997.

HIBBARD, J. & CARILLO, K.M., "Knowledge Revolution: Getting employees to share what they know is no longer a technology challenge — it's a corporate culture challenge", *Information Week*, No. 663, January 5, 1998.

HIEBELER, R.J., "Benchmarking: Knowledge Management", *Strategy & Leadership*, Vol. 24, No. 2, pp. 22-29, March-April 1996.

HILDEBRAND, C., "Does KM = IT?", *CIO Magazine*, URL http://www.cio.com/archive/enterprise/091599_ic.html, accessed July 2002, September 15, 1999.

HOFTE, G.H. TER, *Working Apart Together: Foundations for Component Groupware*, Thesis, Telematica Instituut, 1998.

HOPE, V. & HENDRY, J., "Corporate Cultural Change — Is It Relevant for the Organisations of the 1990s?", *Human Resource Management Journal*, Vol. 5, No. 4, pp. 61-73, 1995.

HORN, P.M., "Information Technology Will Change Everything", *Research Technology Management*, pp. 42-47, January-February 1999.

HUBER, G.P., "A Theory on the Effects of Advanced Information Technologies on Organizational Design, Intelligence, and Decision Making", *Academy of Management Review*, Vol. 15, No. 1, pp. 47-71, 1990.

HUBER, G.P., "Organizational Learning: The Contributing Processes and the Literatures", *Organization Science*, Vol. 2, No. 1, pp. 88-115, 1991.

HUBER, G.P., "Transferring Sticky Knowledge: Suggested Solutions and Needed Studies", *Proceedings of the Knowledge Management Conference 2000*, Operational Research Society, Birmingham UK, pp. 12-22, July 2000.

HUYSMAN, M. & WIT, D. DE, "Knowledge Management in Practice", *Proceedings of the Knowledge Management Conference 2000*, Operational Research Society, Birmingham UK, pp. 324-333, July 2000.

INGEN HOUSZ, F., *Rapport Kennismanagement bij VROM*, Internal publication Ministry of Housing, Spatial Planning, and the Environment of the Netherlands, The Hague, September 2000.

INKPEN, A.C., "Creating Knowledge through Collaboration", *California Management Review*, Vol. 39, No. 1, pp. 123-140, Fall 1996.

ISAKOWITZ, T., "Hypermedia, Information Systems and Organizations: A Research Agenda", *Proceedings of the Twenty-Sixth Hawaii International Conference on System Sciences '93*, IEEE Press, CA, Vol. 3, pp. 361-369, 1993.

ISKE, P.L., "Portals and the Knowledge Value Chain: Combining an off-line Approach with web-based KM", *Knowledge Management Magazine*, Vol. 5, Issue 6, pp. 16-19, March 2002.

JAARSVELD, S. VAN, *Frequently Asked Questions*, London School of Economics and Political Science, URL http://www.lse.ac.uk/collections/meetthedirector/faqs.htm, accessed April 2003.

JACOBS, D., *Spel en Discipline; Wanneer draagt Strategie bij?*, Scriptum Books, Schiedam, 1999.

JAMES, G., "IT Helps HR Become Strategic", *Datamation*, Vol. 43, No. 4, pp. 110-114, April 1997.

JARVENPAA, S.L. & IVES, B., "The Global Network Organization of the Future: Information Management Opportunities and Challenges", *Journal of Management Information Systems*, Vol. 10, No. 4, pp. 25-57, 1994.

JONES, G.R. & GEORGE, J.M., "The Experience and Evolution of Trust: Implications for Cooperation and Teamwork", *Academy of Management Review*, Vol. 23, No. 3, pp. 531-546, July 1998.

KAPLAN, R.S. & NORTON, D.P., "Strategic Learning & the Balanced Scorecard", *Strategy & Leadership*, pp. 18-24, September-October 1996.

KAPLAN, S., "KM The Right Way", *CIO Magazine*, URL http://www.cio.com/archive/071502/right.html, accessed July 2002, July 15, 2002.

KAPLAN, S., "KM The Right Way", *CIO Magazine*, URL http://www.cio.com/archive/071502/right.html, accessed July 2002, July 15, 2002.

KAPOOR, S.G., *The Learning Process and the Organization*, University of Illinois at Urbana-Champaign, Department of Mechanical and Industrial Engineering, URL http://mtamri.me.uiuc.edu/spc/ie235/point6_7_13.html, accessed April 2003, 2002.

KEEN, P.G.W., "Information Technology and the Management Difference: A Fusion Map", *IBM Systems Journal*, Vol. 32, No. 1, pp. 17-39, 1993.

KEMPEN, P.M., "Verkenning in Kennisland", *Holland Management Review*, Vol. 16, No. 66, pp. 72-79, Juli-Augustus 1999.

KESSELS, J.W.M., "Verleiden tot Kennisproductiviteit", *Management Consultant*, URL http://managementconsult.profpages.nl/man_bib/ora/kessels01.pdf, accessed August 2002, February 8, 2001.

KNAPP, E. & YU, D., "Understanding Organizational Culture: How Culture Helps or Hinders the Flow of Knowledge", *Knowledge Management Review*, Issue 7, pp. 16-21, March/April 1999.

KNIGHT, T., "A Strategic Approach to Knowledge Management: Aligning Knowledge Management with Organisational Objectives at the DoH", *Knowledge Management Magazine*, Vol. 5, Issue 4, pp. 37-41, December 2001/January 2002.

KRAUSE, R., *Unternehmensressource Kreativität. Trends im Vorschlagwesen, Erfolgreiche Modelle, Kreativitätstechniken und Kreativitäts-Software*, Wirtschaftsverlag Bachem, Köln, 1996.

KROGH, G. VON, "Care in Knowledge Creation", *California Management Review*, Vol. 40, No. 3, pp. 133-153, Spring 1998.

KROGH, G. VON, NONAKA, I. & NISHIGUCHI, T., *Knowledge Creation: A Source of Value*, Macmillan Press Ltd, London, 2000.

KRUIZINGA, E., "Kennislogistiek en Kennismarkt; Domeinen voor de Informatie Professional", *Informatie Professional*, Vol. 1, No. 12, pp. 19-21, 1997.

KURZWEIL, R., *The Age of Spiritual Machines*, Phoenix, London, 1999.

KWAST, A. VAN DER, *Van Horen Zeggen: Onderzoek naar de Bekendheid en Benutting van Onderzoek bij de RPD*, Internal publication Ministry of Housing, Spatial Planning, and the Environment of the Netherlands, The Hague, April 2001.

LANDRY, J., "Information Characteristics as Constraints to Innovation", *Proceedings of the Twenty-Fifth Hawaii International Conference on System Sciences '92*, IEEE Press, CA, Vol. 4, pp. 482-491, 1992.

LEE, A.S., "A Scientific Methodology for MIS Case Studies", *MIS Quarterly*, Vol. 13, No. 1, pp. 33-50, March 1989.

LEE, A.S., "Electronic Mail as a Medium for Rich Communication: An Empirical Investigation Using Hermeneutic Interpretation", *MIS Quarterly*, Vol. 18, No. 2, pp. 143-157, June 1994.

LEIDNER, D.E. & ELAM, J.J., "The Impact of Executive Information Systems on Organizational Design, Intelligence, and Decision Making", *Organization Science*, Vol. 6, No. 6, pp. 645-664, November-December 1995.

LELIC, S., *The Knowledge: Dan Holtshouse*, Knowledge Management Magazine, URL http://www.kmeurope.com/kminterview2.asp, accessed June 2002, 2002.

LENT, D. VAN & DANKO, Q., "De Kenniswerkers: Wie Het Weet Mag Het Zeggen", *Financieel Economisch Magazine*, pp. 12-16, 20 September 1997.

LIN, B., "Managing in an Information Highway Age: Critical Issues", *Internet Research: Electronic Networking Applications and Policy*, Vol. 6, No. 4, pp. 42-437, 1996.

LONG, D.W. DE, "Building the Knowledge-Based Organization: How Culture Drives Knowledge Behaviors", Working Paper, *Ernst & Young's Center for Business Innovation*, Boston, May 1997.

LUCIER, C.E. & TORSILIERI, J.D., "Why Knowledge Programs Fail: A C.E.O.'s Guide To Managing Learning", *Strategy + Business*, Fourth Quarter, pp. 14-28, 1997.

LUCIER, C.E. & TORSILIERI, J.D., "Steal This Idea!", *Strategy + Business*, Issue 20, Third Quarter, pp. 21-24, 2000.

MALHOTRA, Y., *Role of Information Technology in Managing Organizational Change and Organizational Interdependence*, URL http://www.brint.com/papers/change/, 1993.

MALHOTRA, Y., *On Science, Scientific Method and Evolution of Scientific Thought: A Philosophy of Science Perspective of Quasi-Experimentation*, URL http://www.brint.com/papers/science.htm, accessed 1999, 1994.

MALHOTRA, Y., *Enterprise Architecture: An Overview*, URL http://www.brint.com/papers/enterarch.htm, accessed 1998, 1996.

MALHOTRA, Y., *Organizational Learning and Learning Organizations: An Overview*, URL http://www.brint.com/papers/orglrng.htm, accessed 1998, 1996a.

MALHOTRA, Y., *Knowledge Management for the New World of Business*, URL http://www.brint.com/km/whatis.htm, accessed 1999, 1997.

MALHOTRA, Y., "Knowledge Management in Inquiring Organizations", *Proceedings of 3rd Americas Conference on Information Systems* (Philosophy of Information Systems Mini-track), pp. 293-295, Indianapolis, 1997a.

MALHOTRA, Y., "Knowledge Management for E-Business Performance: Advancing Information Strategy to 'Internet Time'", *Information Strategy, The Executive's Journal*, Vol. 16, No. 4, pp. 5-16, Summer 2000.

MANASCO, B., *What's Beyond the Hype? Principles and Practices*, URL http://www.webcom.com/quantera/Empires1298.html/, accessed July 2002, 2002.

MANVILLE, B. & FOOTE, N., "Harvest Your Workers' Knowledge", *Datamation*, Vol. 42, No. 13, pp. 78-82, July 1996.

MARKUS, M.L., "Power, Politics and MIS Implementation", *Communications of the ACM*, Vol. 26, No. 6, pp. 430-444, June 1983.

MARTINSONS, M.G., "Knowledge-based Systems Leverage Human Resource Management Expertise", *International Journal of Manpower*, Vol. 16, No. 2, pp. 17-34, 1995.

MARTINSONS, M.G., "Assimilating Knowledge-based Systems: The Roads to Success", *International Journal of Manpower*, Vol. 16, No. 8, pp. 22-37, 1995a.

MASLOW, A.H., *Toward a Psychology of Being*, Van Nostrand Reinhold, New York, 1968.

MASON, R.M., "Strategic Information Systems: Use of Information Technology in a Learning Organization", *Proceedings of the Twenty-Sixth Hawaii International Conference on System Sciences '93*, IEEE Press, CA, Vol. 4, pp. 840-849, 1993.

MCDERMOTT, R., *Knowing in Community: 10 Critical Success Factors in Building Communities of Practice*, URL http://www.co-i-l.com/coil/knowledge-garden/cop/knowing.shtml, accessed April 2001, 2000.

MCDERMOTT, R., "Knowing is a Human Act", *Informatik/Informatique*, URL http://www.svifsi.ch/revue/pages/issues/n021/in021.html, No. 1, accessed July 2002, 2002.

MCGEE, J.V. & PRUSAK, L., *Strategisch Informatiemanagement (Managing Information Strategically)*, BoekWerk Groningen, 1996.

MCMASTER, M., *A View from the Emerging Sciences of Complexity*, URL http://www.coil.com/coil/knowledge-garden/oi/articles/foresight/index.shtml, 1996.

MEER, K. VAN DER, *Documentaire Informatiesystemen*, Nederlandse Bibliotheek en Lektuur Centrum, Den Haag, 1991.

MINER, A.S. & MEZIAS, S.J., "Ugly Duckling No More: Pasts and Futures of Organizational Learning Research", *Organization Science*, Vol. 7, No. 1, pp. 88-99, 1996.

MINSKY, M., "A Framework for Representing Knowledge", 1974, in *Mind Design*, ed. Haugeland, J., The MIT Press, Cambridge, 1987.

MOHRMAN, S. & FINEGOLD, D., *Strategies for the Knowledge Economy: From Rhetoric to Reality*, World Economic Forum, Davos, January 2000.

MORELLO, D.T., *The Disruptive Impact of Knowledge Work: Retention*, URL http://gartner3.gartnerweb.com/public/static/hotc/hc00093294.html, accessed October 2000, 10 October 2000.

MORGAN, G., *Beelden van Organisatie (Images of Organization)*, Scriptum Books, Schiedam, 1992 (Sage Publications, London, 1986).

MORRIS, D., *De Naakte Aap (The Naked Ape)*, A.W. Bruna Uitgevers, Utrecht, 1993 (Jonathan Cape, 1967).

MORRISON, J., "Team Memory: Information Management for Business Teams", *Proceedings of the Twenty-Sixth Hawaii International Conference on System Sciences '93*, IEEE Press, CA, Vol. 4, pp. 122-131, 1993.

NEVIS, E.C., DIBELLA, A.J. & GOULD, J.M., *Understanding Organizations as Learning Systems*, Massachusetts Institute of Technology, URL http://learning.mit.edu:80/res/wp/index.html, Winter 1995.

NONAKA, I. & TAKEUCHI, H., *The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation*, New York, Oxford University Press, 1995.

NOORDEGRAAF, M., *Krachtig Kennismanagement: Denkkader voor kennismanagement bij de (rijks)overheid*, publication Ministry of the Interior and Kingdom Relations of the Netherlands, The Hague, October 2001.

NOSEK, J.T., *Exploring Information Technology Support for Organizational Learning in the Virtual Corporation*, Temple University, Philadelphia, URL http://lattanze.loyola.edu/lattanze/research/wp0996.030.html, 1996.

O'DELL, C. & JACKSON GRAYSON, C., *If We Only Knew What We Know: Identification and Transfer of Internal Best Practices*, American Productivity & Quality Center, Houston, 1997.

OLDENKAMP, J.H., *Succesvol Overdragen van Kennis: Over het Doorbreken van Belemmeringen voor Kennismanagement*, Lemma, Utrecht, 2001.

OLDENKAMP, J.H., "Limitations of Managing Knowledge Sharing", *Proceedings 2nd European Conference on Knowledge Management*, Bled, November 2001a.

OLDENKAMP, J.H., *Professioneel Leren: Over Samen Groeien binnen Gezonde Ondernemingen*, Lemma, Utrecht, 2002.

ORLIKOWSKI, W.J., "The Duality of Technology: Rethinking the Concept of Technology in Organizations", *Organization Science*, Vol. 3, No. 3, pp. 398-427, August 1992.

ORLIKOWSKI, W.J., "Knowing in Practice: Enacting a Collective Capability in Distributed Organizing", *Organization Science*, Vol. 13, No. 3, pp. 249-273, May-June 2002.

PARLBY, D., *The Knowledge Journey: A Business Guide to Knowledge Management*, KPMG Consulting, London, URL http://www.kpmg.co.uk/kpmg/uk/services/manage/pubs/journey.html, accessed December 1999, 1999.

PARLBY, D., *Knowledge Management Research Report 2000*, KPMG Consulting, London, November 1999a.

PENNINGS, J.M., "Lerende Organisaties: Nieuwe Wijn in Oude Vaten?", *Management & Organisatie*, No. 1, pp. 37-55, Februari/Maart 1997.

PHILLIPS, T., "Talking of the Intranet", *Director*, pp. 62-66, November 1997.

POST, G.J.J. & WEGGEMAN, M.C.D.P., "Kennismanagement onder Adviseurs", *Bedrijfskunde*, Vol. 69, No. 1, pp. 42-48, 1997.

POWELL, T.C. & DENT-MICALLEF, A., "Information Technology as Competitive Advantage: The Role of Human, Business, and Technology Resources", *Strategic Management Journal*, Vol. 18, No. 5, pp. 375-405, 1997.

PRAHALAD, C.K. & HAMEL, G., "The Core Competence of the Corporation", *Harvard Business Review*, pp. 79-91, May-June 1990.

QUINN, J.B., *Intelligente Ondernemingen: Een Nieuw Model voor een Nieuwe Tijd (Intelligent Enterprise: A Knowledge and Service Based Paradigm for Industry)*, Uitgeverij Contact, Amsterdam, 1994 (The Free Press, New York, 1992).

QUINN, J.B., ANDERSON, P. & FINKELSTEIN, S., "Managing Professional Intellect: Making Most of the Best", *Harvard Business Review*, pp. 71-80, March-April 1996.

QURESHI, A., VAN DER VAART, A., KAULINGFREEKS, G., DE VREEDE, G.J., BRIGGS, R.O. & NUNAMAKER, J., "What does it mean for an Organisation to be Intelligent? Measuring Intellectual Bandwidth for Value Creation", *Proceedings of the Twenty-Sixth Hawaii International Conference on System Sciences - 35*, IEEE Computer Society Press, 2002.

RADA, J.F., "Thoughts on Organizational Utopia", *Journal of Strategic Change*, Vol. 4, 1995.

RAS, H., "Koninklijke Luchtmacht 2001, de Kracht van Teamwork", *Leaflet of the Royal Netherlands Air Force*, Den Haag, 2000.

RENKEMA, T.J.W., "Rendabel Investeren in Informatietechnologie", *Holland/Belgium Management Review*, No. 57, pp. 55-62, 1997.

ROBINSIN, A.G. & STERN, S., *Corporate Creativity: How Innovation and Improvement Actually Happen*, Berrett-Koehler Publishers, San Francisco, 1997.

RUGGLES, R., *Why Knowledge? Why Now?*, Ernst & Young Center for Business Innovation, URL http://www.cbi.cgey.com/journal/issue1/features/whykno/author.html, accessed October 2002, January 1997.

SAFFO, P., "Are You Machine Wise?", *Harvard Business Review*, pp. 28-30, September-October 1997.

SCHARMER, C.O., *Awareness is the First and Critical Thing: Conversation with Professor Wanda Orlikowski*, Massachusetts Institute of Technology, Sloan School of Management, URL http://www.dialogonleadership.org/Orlikowski-1999.pdf, accessed April 2003, September 1999.

SCHEIN, E.H., *Building the Learning Consortium*, Massachusetts Institute of Technology, Sloan School of Management, URL http://learning.mit.edu:80/res/wp/index.html, accessed August 1997, March 1995.

SCHEIN, E.H., *Learning Consortia: How to Create Parallel Learning systems for Organization Sets*, Massachusetts Institute of Technology, Sloan School of Management, URL http://learning.mit.edu:80/res/wp/index.html, accessed August 1997, August 1995a.

SCHEIN, E.H., *Organizational Learning as Cognitive Re-definition: Coercive Persuasion Revisited*, Massachusetts Institute of Technology, Sloan School of Management, URL http://learning.mit.edu:80/res/wp/index.html, accessed August 1997, 1996.

SCHEIN, E.H., *Organizational Learning: What is New?*, Massachusetts Institute of Technology, Sloan School of Management, URL http://learning.mit.edu:80/res/wp/index.html, accessed August 1997, July 1996a.

SCHEIN, E.H., "Three Cultures of Management: The Key to Organizational Learning", *Sloan Management Review*, pp. 9-20, Fall 1996b.

SCHRÄDER, A., *Management Virtueller Unternehmungen: Organisatorische Konzeption und Informationstechnische Unterstützung Flexibler Allianzen*, Campus Verlag, Frankfurt/New York, 1996.

SENGE, P.M., "The Leader's New Work: Building Learning Organizations", *Sloan Management Review*, pp. 7-22, Fall 1990.

SENGE, P.M., *De Vijfde Discipline: De Kunst en Praktijk van de Lerende Organisatie (The Fifth Discipline: The Art and Practice of The Learning Organization)*, Scriptum Books, Schiedam, 1992 (Doubleday, New York, 1990).

SENGE, P.M., *The Dance of Change: The Challenges to Sustaining Momentum in Learning Organizations*, Doubleday, New York, 1999.

SIESFELD, T., *Feedback Frenzy: Performance Measurement in the Connected Economy*, Ernst & Young Center for Business Innovation, URL http:// www.cbi.cgey.com/pub/docs/Feedback_Frenzy.pdf, accessed October 2002, January 1998.

SKYRME, D.J., *From Information to Knowledge Management: Are You Prepared?*, URL http://www.skyrme.com/pubs/on97full.htm, accessed May 1998, 1997.

SKYRME, D.J., *Virtual Trust: A Key Ingredient of Successful Knowledge Sharing*, URL http://www.skyrme.com/updates/u19.htm, accessed October 2000, 1998.

SMITH, P.A.C., "Systemic Knowledge Management: Managing Organizational Assets for Competitive Advantage", *Journal of Systemic Knowledge Management*, URL http://www.free-press.com/journals/knowledge/issue1/article8.htm, accessed April 1998, April 1998.

SMITH, P. & SHARMA, M., "A Performance-Based Approach to Knowledge Management", *Journal of Knowledge Management Practice*, Vol. 3, URL http://www.tlainc.com/jkmpv3.htm, accessed September 2002, March 2002.

SNOWDEN, D.J., "Cynefin, A Sense of Time and Place: an Ecological Approach to Sense Making and Learning in Formal and Informal Communities", *Proceedings The Knowledge Management Conference 2000*, Operational Research Society, Birmingham UK, pp. 1-11, July 2000.

SNOWDEN, D.J., "Complex Acts of Knowing: Paradox and Descriptive Self-awareness", Working paper for the *Journal of Knowledge Management*, Special Edition, Spring 2002.

SNYDER, C. & TEMPLETON, G., *Toward a Method for Providing Database Structures Derived from an Ontological Specification Process: The Example of Knowledge Management*, Auburn University, URL http://www.learnerfirst.com/LF_4_1_7.htm, accessed March 1998, October 1997.

SOL, H.G., *Simulation in Information Systems Development*, Dissertation, Rijksuniversiteit Groningen, 1982.

SPEEL, P.-H., SHADBOLT, N., DE VRIES, W., VAN DAM, P.H. & O'HARA, K., "Knowledge Mapping for Industrial Purposes", URL http://sern.ucalgary.ca/KSI/KAW/KAW99/papers/Speel1/, accessed September 2001, 1999.

SPEK, R. VAN DER & SPIJKERVET, A., *Kennismanagement: Intelligent Omgaan met Kennis*, Kenniscentrum CIBIT, Utrecht, 1996.

SPITZER, Q. & EVANS, R., *Heads, You Win! How the Best Companies Think*, Simon & Schuster, New York, 1997.

STATA, R., "Organization Learning — The Key to Management Innovation", *Sloan Management Review*, Spring, pp. 63-74, 1989.

STEBBINS, M.W. & SHANI, A.B., "Organization Design and the Knowledge Worker", *Journal of Systemic Knowledge Management*, URL http://www.free-press.com/journals/knowledge/issue1/article5.htm, accessed April 1998, February 1998.

STENMARK, D., "Asynchronous Brainstorm: An Intranet Application for Creativity", *Proceedings of WebNet '99*, pp. 1429-1430, AACE Press, Honolulu, 1999.

STENMARK, D., "Leveraging Tacit Organizational Knowledge", *Journal of Management Information Systems*, Vol. 17, No. 3, pp. 9-24, 2001.

STEWART, TH.A., "Brain Power: Who Owns It… How They Profit from It", *Fortune*, pp. 105-110, March 17, 1997.

STEWART, TH.A., *Intellectual Capital. The New Wealth of Organizations*, Nicolas Brealey Publishing Ltd, London, 1997a.

STOKKUM, W. VAN, KRUIZINGA, E. & SPEK, R. VAN DER, *Developing Knowledge-Based Systems: Using System Development Framework SDF™*, Kenniscentrum CIBIT, Utrecht, 1996.

STRASSMANN, P.A., *The Value of Computers, Information and Knowledge*, URL http://www.strassmann.com/pubs/cik/cik-value.shtml/, accessed April 1998, January 1996.

STRASSMANN, P.A., *The Value of Knowledge Capital*, URL http://www.strassmann.com/pubs/valuekc/, accessed April 1998, March 1998.

SVEIBY, K.E., *The New Organizational Wealth. Managing & Measuring Knowledge-based Assets*, Berret-Koehler, San Francisco, 1997.

SWAN, J. & SCARBROUGH, H., "The Paradox of 'Knowledge Management'", *Informatik/Informatique*, URL http://www.svifsi.ch/revue/pages/issues/n021/in021.html, No. 1, accessed July 2002, 2002.

TENKASI, R.V. & BOLAND, R.J., "Exploring Knowledge Diversity in Knowledge Intensive Firms: A New Role for Information Systems", *Journal of Organizational Change*, Vol. 9, No. 1, pp. 79-91, 1996.

TER HOFTE, G.H. *see* HOFTE, G.H. TER.

TOFFLER, A., *Powershift: Knowledge, Wealth, and Violence at the Edge of the 21st Century*, Bantam Books, 1991.

TRUSSLER, S., "The Rules of the Game", *Journal of Business Strategy*, Vol. 19, No. 1, pp. 16-19, January/February 1998.

TSANG, E.W.K., "Organizational Learning and the Learning Organization: A Dichotomy Between Descriptive and Prescriptive Research", *Human Relations*, Vol. 50, No. 1, pp. 73-89, 1997.

TUOMI, I., "Data Is More Than Knowledge: Implications of the Reversed Knowledge Hierarchy for Knowledge Management and Organizational Memory", *Proceedings of the 32nd Hawaii International Conference on System Sciences*, IEEE Computer Society Press, 1999.

TUSHMAN, M.L. & NADLER, D.A., "Information Processing as an Integrating Concept in Organizational Design", *Academy of Management Review*, Vol. 3, pp. 613-624, July 1978.

ULRICH, D., "Intellectual Capital = Competence X Commitment", *Sloan Management Review*, Vol. 39, No. 2, pp. 15-26, Winter 1998.

UNILEVER, *Unilever Research Prize 1998*, External publication of Unilever Research Vlaardingen, ISBN 90.6496.164.6, Vlaardingen, 1999.

UNILEVER, *Mensen, merken, maatschappij*, External publication of Unilever Nederland, Rotterdam, 2001.

VAN BLADEL, R.J.E.M. *see* BLADEL, R.J.E.M. VAN.

VAN DEN BRINK, P. *see* BRINK, P. VAN DEN.

VAN DER KWAST, A. *see* KWAST, A. VAN DER.

VAN DER MEER, K. *see* MEER, K. VAN DER.

VAN DER SPEK, R. *see* SPEK, R. VAN DER.

VAN HEIJST, G. *see* HEIJST, G. VAN.

VAN JAARSVELD, S. *see* JAARSVELD, S. VAN.

VAN LENT, D. *see* LENT, D. VAN.

VAN STOKKUM, W. *see* STOKKUM, W. VAN.

VANCE, D., "Information, Knowledge and Wisdom: The Epistemic Hierarchy and Computer-Based Information Systems", *Proceedings of the 1997 America's Conference on Information Systems*, URL http://hsb.baylor.edu/ramsower/ais.ac.97/papers/vance2.htm, accessed September 2002, 1997.

VELICER, W.F., PROCHASKA, J.O., FAVA, J.L., NORMAN, G.J. & REDDING, C.A., "Smoking Cessation and Stress Management: Applications of the Transtheoretical Model of Behavior Change", *Homeostasis*, No. 38, pp. 216-233, 1998.

VOGEL, P., "Know Your Business: Build a Knowledgebase!", *Datamation*, Vol. 42, No. 13, pp. 84-87, July 1996.

VOGT, E.E., *The Nature of Work in 2010: Convergence and the Workplace*, URL http://www.micromentor.com/mm/aspen.htm, 1995.

VON KROGH, G. *see* KROGH, G. VON.

VOYER, J.J., GOULD, J.M. & FORD, D.N., *Systematic Creation of Organizational Anxiety: An Empirical Study*, Massachusetts Institute of Technology, URL http://learning.mit.edu:80/res/wp/index.html, accessed September 1997, August 1996.

VREEDE, G.J. DE, *Facilitating Organizational Change: The Participative Application of Dynamic Modelling*, Dissertation, Delft University of Technology, 1995.

VREEDE, G.J. DE & BRIGGS, R.O., "Beter en Sneller Samenwerken met Elektronische Vergadersystemen", *Holland/Belgium Management Review*, No. 53, pp. 75-85, 1997.

WALSHAM, G., "Interpretive Case Studies in IS Research: Nature and Method", *European Journal of Information Systems*, Vol. 4, pp. 74-81, 1995.

WEGGEMAN, M.C.D.P., "Cultuur en Managementstijl in Kennisintensieve Organisaties", *Holland/Belgium Management Review*, No. 54, pp. 62-72, 1997.

WEGGEMAN, M.C.D.P., *Kennismanagement: de Praktijk*, Scriptum, Schiedam, 2000.

WEICK, K.E., "The Nontraditional Quality of Organizational Learning", *Organization Science*, Vol. 2, No. 1, pp. 116-122, 1991.

WIIG, K.M., *On the Management of Knowledge*, Knowledge Management Forum, URL http://www.km-forum.org//wiig.htm, accessed January 2000, March 1996.

WIIG, K.M., DE HOOG, R. & VAN DER SPEK, R., "Supporting Knowledge Management: a Selection of Methods and Techniques", *Expert Systems With Applications*, Vol. 13, No. 1, pp. 15-27, July 1997.

WILSON, F.A., "The Socio-Cybernetic Paradox of the Networked Firm", *Information Technology & People*, Vol. 9, No. 2, pp. 3-23, 1996.

YARZA LUACES, J., *Bosch and Flemish Painting (15th century)*, Fundación Amigos del Museo del Prado, Madrid, 2002.

ZOLLO, M. & WINTER, S.G., "Deliberate Learning and the Evolution of Dynamic Capabilities", *Organization Science*, Vol. 13, No. 3, pp. 339-351, May-June 2002.

ZORPETTE, G. & EZZELL, C., "Your Bionic Future", *Scientific American*, Vol. 10, No. 3, Special Issue, Fall 1999.

B INDEX

T

U

V

W

C INFORMATION & COMMUNICATION TECHNOLOGY TOOLS

This appendix describes tools of information and communication technology (see Figure C.1 below) that can be used to realize the functionalities as described in Subsection 3.7.2 (Anderson and Smith, 1998). Because this area is in a state of flux, this overview is not exhaustive but covers the most important tools and should be able to exhibit the scope, diversity, and overlap of information and communication technology tools that can support knowledge sharing.

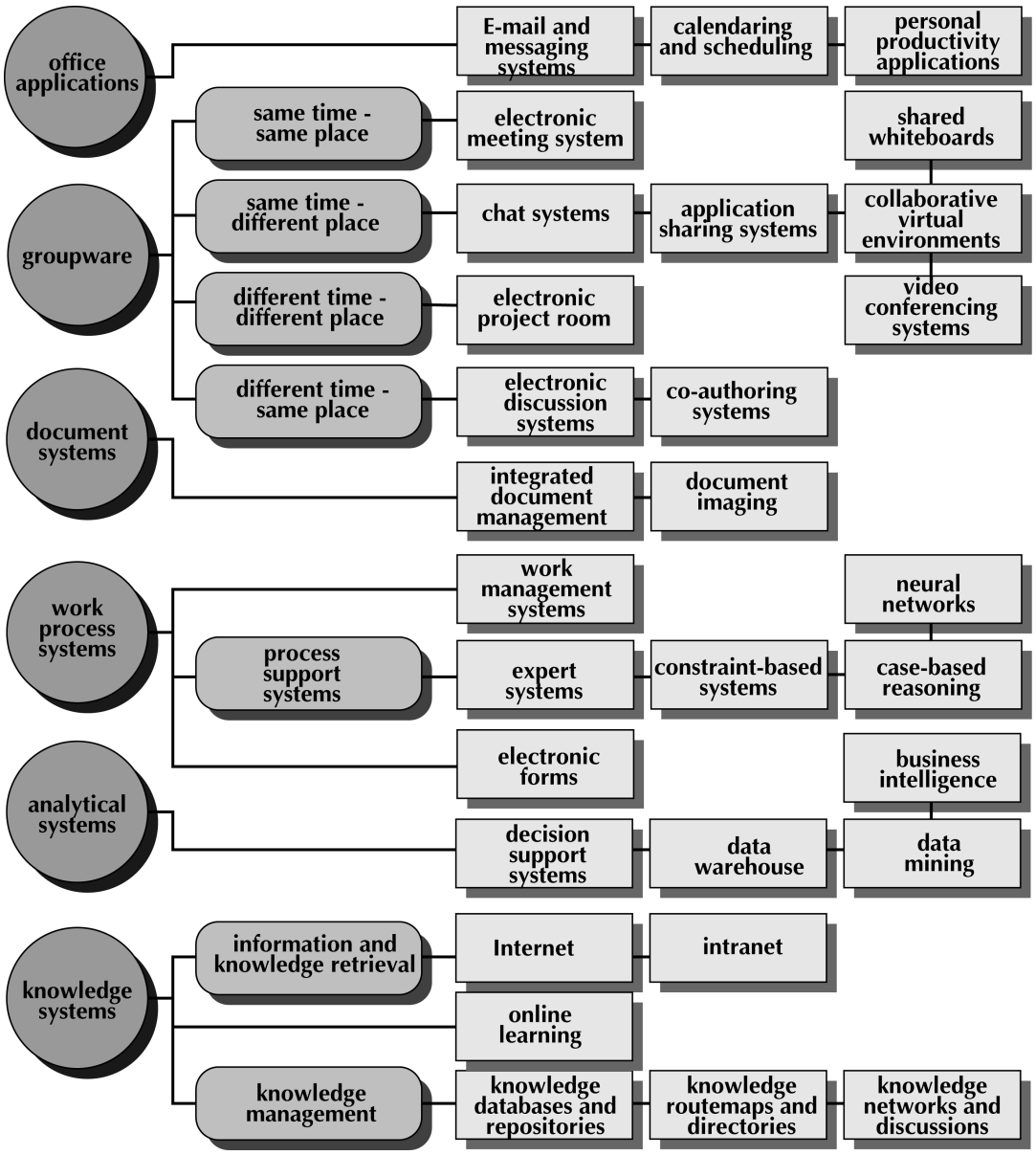


Figure C.1: Information and communication technology tools

C.1 Office applications

Office applications provide the basic functionality that people in an organization need when executing their tasks. We can distinguish three different types of applications (Ander-

son and Smith, 1998): e-mail and messaging systems, calendaring and scheduling, and personal productivity applications.

E-mail and messaging systems

Communication can carry data, text, voice, audio, image, graphics, and video. Traditional forms of communication are face-to-face meetings, (mobile) telephone, facsimile, and memorandums. Newer tools are e-mail, voice mail, and videophone. E-mail is an asynchronous person-to-person electronic message exchange and, according to Elliott (1997a), it "is still the most pervasive and effective means of electronic communication and collaboration. It is real-time, fast, easy, and user driven." Because e-mail filters out important cues such as body language and tone of voice it does not have the communication richness associated with a face-to-face meeting (Lee, 1994), but a drawback of a face-to-face meeting is that it necessitates that people should be together in the same place at the same time.

Calendaring and scheduling

These tools help maintaining and monitoring a to-do list, record appointments, can give insight into the calendars of team members, may schedule meetings, and subsequently generate invitations for those meetings.

Personal productivity applications

These applications often come in an office system suite: word processing, spreadsheets, and creating presentations. Sometimes database applications with query and reporting facilities are employed. Newer developments in the area of personal assistance are: speech generation and understanding, imaging and visualization (using animation and 3-D displays for instance to create a virtual reality), and language translation.

C.2 Groupware

Groupware facilitates — electronically — group or teamwork and collaboration (Duffy, 1996; Elliott, 1997a), and "make it more feasible for teams to coordinate asynchronously (across time zones) and geographically" (Powell and Dent-Micallef, 1997).

The groupware (sometimes also called computer-supported cooperative work systems, collaborative groupware, or workgroup systems) technology creates a distributed virtual environment that should support for (Duffy, 1996): communication between people (for example sending notes, videoconferencing, and having interactive discussions), sharing and collaboration between people (for example co-authoring, group editing and reviewing, and sharing of documents, information, and thoughts), and organizational coordination (for instance to keep track of communications and activities of a group and corporate calendars).

To classify the groupware applications a 'time versus place' matrix can be used (Hofte, 1998) which distinguishes four types of cooperative work situations, related to the dimensions time (synchronous and asynchronous) and geographical location (local and remote):

Same time - same place

Only a very few groupware applications can be placed in this quadrant. One tool worth mentioning here is the:

Electronic meeting system

Other names used are: electronic meeting room, group decision support system, or group support system. Electronic meeting systems support meeting activities of face-to-face groups (sometimes the group members may be geographically dis-

persed) and are targeted at creative problem solving (possibly through brainstorming) and at increasing the effectiveness of the meeting. An electronic meeting system is mostly based on one PC for each member of the meeting that are mutually connected through a network (Vreede and Briggs, 1997). This tool offers three types of advantages (Vreede and Briggs, 1997; Hofte, 1998):

- It allows for parallel 'speaking': every participant can type his or hers ideas into the system (without having to wait for a suitable moment to speak up). Other participants see these contributions immediately and can give their reactions. This increases the speed of idea production. Because the meeting is electronically recorded, participants are able to look into statements made some time earlier in the session to pick up a thread.
- It offers the possibility of making contributions anonymously to "alleviate non-functional socially inhibiting factors, anonymity may facilitate proposing bold ideas and giving honest opinions about ideas" (Hofte, 1998). Vreede and Briggs (1997) note that because of the anonymity, ideas are only judged by their value, without any influence from (the hierarchical position of) the person who proposed the idea. Balasubramanian (1996) argues that "anonymity promotes greater interaction, equal participation, objectivity, and better problem-solving."
- All proposed ideas, spoken remarks, and uttered comments are electronically recorded and organized during the meeting (in which speech recognition may be applied) and available for other people who can use these minutes for example to solve a similar or related problem. These minutes not only hold the outcomes of the process but they capture the complete decision-making process. "The ability to review and question the rationale behind decisions made earlier is the basis behind double-loop learning" (Balasubramanian, 1996).

Same time - different place

The main groupware applications that can be placed in this quadrant are: chat systems, application sharing systems, shared whiteboards, collaborative virtual environments, and videoconferencing systems.

Chat systems

Chat systems provide text-based, online computer-mediated discussions between people by typing messages that are immediately visible on the screens of other people (Hofte, 1998). Transcript functionality helps in capturing ideas.

Application sharing systems

"Application sharing systems allow existing single-user applications to be used without modification by multiple users, simultaneously" (Hofte, 1998). The application (other names used are screen or window sharing systems) collects input from one user at a time and presents the output on the screens of all the other users. All actions (including cursor movements and menu navigation) of a person are immediately visible to the other team members.

Shared whiteboards

Shared whiteboard systems (or shared drawing systems or electronic whiteboards) aid two or more geographically dispersed people to review and work with the same drawing, clarifying details, and proposing modifications by altering the drawing (Hofte, 1998; Elliott, 1997a).

Collaborative virtual environments

These systems comprise applications such as multiplayer games (the game of chess for instance has a relation with research into artificial intelligence), virtual

worlds (simulations of a difficult to create reality are made possible through virtual reality environments), and (for education and training purposes) distributed battlefield simulations (Hofte, 1998).

Video conferencing systems

These (multimedia conferencing) systems enable face-to-face meetings to take place between people who are geographically separated. Distant conferencing used to be possible with audio only communications (the telephone). Nowadays video conferencing systems (portable, from a dedicated room, or from the desktop) offer synchronized data, audio, and video communication flows (Hofte, 1998).

Different time - same place

At this moment, the only groupware application that can be classified in this quadrant is the electronic project room (Hofte, 1998). An electronic project room is a dedicated, shared virtual space for project members with a need for constant contact with each other and with access to the (intermediate) results of the project. Karlenzig (2002) describes this functionality as "Collaborative project spaces cut through geographic discontinuity by providing shared access to documents, blueprints and threaded discussions for product and project development. Collaborative project space typically includes synchronous (real-time) functions such as real-time chat, instant messaging and screen sharing, as well as asynchronous functions such as threaded discussion and document sharing."

Different time - different place

Two main groupware applications fit in this quadrant: electronic discussion systems and co-authoring systems.

Electronic discussion systems

These systems "allow users to send a message to a uniquely identified place in cyberspace devoted to discussion about a particular topic" (Hofte, 1998). Other people at presumably other locations react at a later time to these messages with their point of view or answer to a posed question. The structuring of these discussions ('threaded' discussions indicate who said what in response to whom) enables people to follow the history of discussion on a subject and may provide an ongoing dialogue (Elliott, 1997a). Examples of these electronic discussion systems are: electronic bulletin boards, discussion databases, and newsgroups.

Co-authoring systems

Hofte (1998) writes that "Co-authoring systems are explicitly designed to support multiple users in their joint effort to create a document, the most frequent task which computers help people to accomplish." Co-authoring (or collaborative, joint, or shared editing) systems offer features like processing revisions of different users, management of versions and drafts of documents and document routing for (sequential) group authoring.

C.3 Document systems

This functionality offers support for document creation, imaging, indexing, storage, retrieval, and life cycle management of (increasingly digital, electronic) documents. Anderson and Smith (1998) define two different types of applications: integrated document management and document imaging.

Integrated document management

Integrated document management (other names are documentary information systems, document management systems, electronic publishing, document libraries, and (distributed) document databases) comprises library services, document manufacturing and publishing, and document-interchange technologies (Anderson and Smith, 1998). Features of these systems include content management and structured document repositories (Elliott, 1997a; Davenport, 1994), which, as suggested by Balasubramanian (1996), may apply hypermedia to "allow people to create, annotate, link together, and share information from a variety of media such as text, graphics, audio, video, and images." Hypertext is defined by Isakowitz (1993) as a system that "consists of nodes, that contain information, and of links, that represent relationships between nodes. Buttons or anchors are regions within nodes where links originate or terminate. To traverse a link, a user activates a button, e.g., clicking on it with the mouse. Hypermedia extends hypertext by incorporating multimedia."

Document imaging

Document imaging supports the transfer of paper documents into electronic form that is stored in an electronic archive or database.

C.4 Work Process systems

This functionality of information and communication technology manages the execution of the workflow and the (interaction of the) related work processes. Work process systems can be divided in three different types of applications: work management systems, process support systems, and electronic forms.

Work management systems

Work management systems (other names used are workflow management, office procedure systems, or coordination systems) realize the electronic support, management, and control of (administrative) business processes. These systems commonly offer facilities to formally define administrative business processes and the routing of information, forms, and documents between the human actors and applications involved (Hofte, 1998). Elliott (1997a) notes that "It manages documents as they flow through the system, making sure that the right people are viewing the document, making changes as required, and doing it all in a timely manner."

Process support systems

Next to the more traditional systems, some work process systems apply artificial intelligence and focus more on real-time problem resolution for specific processes or functions (Elliott, 1997a). This type of system incorporates knowledge from experts or descriptions about possible scenarios and is applied for instance in processes that interact with the customer (like customer support). Examples are (Davenport, 1996):

Expert systems

Expert systems make inferences based on a fixed set of rules (Balasubramanian, 1996), in which the knowledge of one or a few experts is captured and which is used by a much broader group of people.

Constraint-based systems

Davenport (1996) defines this as follows: "Constraint-based systems capture and model the constraints that govern a complex problem situation."

Case-based reasoning

Case-based reasoning uses cases in which knowledge about a particular domain or context is incorporated and which suggests probable scenarios to come to a

solution (Davenport, 1996; Elliott, 1997a); it remembers a previous similar situation and applies information and knowledge of that situation to the problem at hand.

Neural networks

Neural networks are mathematical models that emulate some of the observed properties of biological nervous systems (neurons and synapses). These systems especially enable pattern recognition and classification of imprecise input data.

Electronic forms

Electronic forms or E-forms are tools which can replace paper and which can help to automate administrative processes (Davenport, 1996). An electronic form is electronically routed through the organization. An example is an expense form which is electronically signed and which needs various levels of approval. This expense form is routed to several people in the organization before it is fulfilled.

C.5 Analytical systems

Analytical systems support analysis and interpretation of (structured) data for operational and strategic planning and decision-making (Anderson and Smith, 1998). These tools can help to make more use of the enormous amounts of data that are internally and externally available. Four different types of tools can be distinguished for analytical systems: decision support systems, data warehouse, data mining, and business intelligence.

Decision support systems

Decision support systems, executive information systems, or enterprise information systems are tools that support the decision maker in solving ill-defined problems. These tools have, in general, user-friendly and powerful interfaces to a database that allows easy navigation through strategic information, offer exception reporting, drill-down and trend analysis, and explore decision trees by means of 'what-if?' questions (Leidner and Elam, 1995). It can help an organization to monitor its current status (possibly through quantification of its critical success factors) and its progress toward achieving its goals or strategy.

Data warehouse

A data warehouse (or data mart) is a database in which data from several heterogeneous sources is collected, integrated, and organized. This — mostly subject-oriented — data is made available for queries and analysis to support the decision making process.

Data mining

Data mining (or online analytical processing) is a (statistical advanced) tool to find and recognize hidden patterns, trends, and relationships in large quantities of data by looking at several dimensions at the same time. A closely related tool is text mining, this tool operates on large sets of text documents in order to discover some previously unknown pattern.

Business intelligence

Business intelligence is the ability of an organization to analyze the market — news about customers, competitors, industry, and technology — and to convert hard and soft information into knowledge about one's competitive position and to make tactical and strategic business decisions (Spek and Spijkervet, 1996; Nosek, 1996).

C.6 Knowledge systems

Knowledge systems are technologies and methodologies that facilitate the capturing, storing, accessing, and sharing of information and knowledge within an organization (Anderson and Smith, 1998). Knowledge systems can be divided in three different types of applications: information and knowledge retrieval, online learning, and knowledge management.

Information and knowledge retrieval

This functionality enables people to access the information and knowledge they need. Two major information and knowledge retrieval tools are the Internet and intranet (an intranet is an Internet within an organization). Relevant features of these tools are: it is a medium for publication, it is a platform for communication and collaboration, a search engine is employed to search for information or explicit knowledge you need, a browser — a graphical user interface — is used to navigate through the stored information, push and pull mechanisms are supported (information is sent to the user versus the user retrieves the information), and the used communications protocol is widely accepted.

Internet

The Internet (or the World Wide Web) is a gigantic information space that consists of worldwide networks of interconnected computers. The hypertext stored on these computers can be hyperlinked (they contain hypertext links or pointers) to each other — like a virtual web (Eleveld, 1997), which enables a user to surf from document to document. World Wide Web documents may contain text, data, graphics, images, voice, audio, and video.

Intranet

An intranet differs from the Internet in that it is not public, but a platform to support information and knowledge retrieval *within* the organization. In general, all employees have (location independent) access to the intranet and can retrieve or add information or make use of enterprise applications. An extranet is an intranet shared between (part of) distinct organizations.

An enterprise portal is an intranet application that serves as a single, consistent window through which information can be found and applications can be presented to users. Iske (2002) distinguishes the following knowledge sharing functionality that portals can offer: internal news and internal communications; external news; on-line community space; on-line team room; on-line collaboration; expert locator (yellow pages) en Query&Answer systems; library; profiling (push/pull mechanisms); search and retrieval; categorization or knowledge mapping; user information (about their needs and knowledge-based behavior); and on-line learning.

Online learning

Online learning (other names used are distance learning, computer based training, computer-mediated distance education, or virtual online education) enables self-paced, interactive, multimedia learning via the computer. Online learning creates virtual classrooms bound by neither time nor physical location.

Knowledge management

Knowledge management as a functionality facilitates the knowledge sharing processes. It builds on functionalities and tools as described above, for example groupware and intranet. According to Anderson (1997) knowledge management tools fall into three categories:

Knowledge databases and repositories

This category focuses on explicit knowledge; it stores and makes available information, documents, and explicit knowledge components. Personal digital agents or intelligent agents may support retrieval. Davenport (1994) mentions information maps "that describes the location and availability of the most widely used information" and information guides who are people that guide users to the right kind of information. Elliott (1997) writes about knowledge maps that provide intuitive road maps for people traversing these repositories and knowledge wizards who help navigating through these repositories by using series of queries. Saffo (1997) claims that "the most important new sense-making tools will be those that help people visualize and simulate." Bair (1997) observes that semantic functionality will increase the relevance of retrieved knowledge components because it recognizes homonyms and synonyms in different contexts, and because it helps the user "to 'see' similarity among concepts and objects by presenting context."

Knowledge routemaps and directories

The second category centers on both tacit and explicit knowledge; it may provide pointers to people with a special expertise (a 'yellow pages' service or skill inventory system which helps locating people by expertise, community, skills, the projects they are currently working on or were involved with, interests, and affiliation: Balasubramanian, 1996) or offer links to documents which describe research results or list frequently asked questions. These tools also may aid in codification of tacit knowledge or in 'nuggetizing' (to discover units of knowledge in potentially relevant content).

Knowledge networks and discussions

This category focuses on tacit knowledge; it provides opportunities for electronic interaction between people. These tools may also facilitate functionalities like skill mining (which recognizes the skills of people based on their publications and discussions).

C.7 Knowledge sharing processes versus ICT tools

We propose the following relations (illustrated in Table C.1 below) between the knowledge sharing processes and the tools of information and communication technology as described above.

	Office applications	Groupware	Document systems	Work process systems	Analytical systems	Knowledge systems
Creating knowledge / tacit-to-tacit	• e-mail and messaging systems	• electronic meeting system; • chat systems; • application sharing systems; • shared whiteboards; • collaborative virtual environments; • video conferencing systems; • electronic project room; • electronic				• Internet; • intranet; • online learning; • knowledge routemaps and directories; • knowledge networks and discussions

	Office applications	Groupware	Document systems	Work process systems	Analytical systems	Knowledge systems
		discussion systems; • co-authoring systems				
Creating knowledge / tacit-to-explicit	• e-mail and messaging systems	• electronic meeting system; • chat systems; • application sharing systems; • shared whiteboards; • collaborative virtual environments; • video conferencing systems; • electronic project room; • electronic discussion systems; • co-authoring systems		• work management systems; • expert systems; • constraint-based systems; • case-based reasoning; • neural networks	• decision support systems; • data warehouse; • data mining; • business intelligence	• Internet; • intranet; • online learning; • knowledge databases and repositories; • knowledge routemaps and directories; • knowledge networks and discussions
Creating knowledge / explicit-to-explicit	• e-mail and messaging systems	• electronic meeting system; • chat systems; • application sharing systems; • shared whiteboards; • collaborative virtual environments; • video conferencing systems; • electronic project room; • electronic discussion systems; • co-authoring systems	• integrated document management	• work management systems; • expert systems; • constraint-based systems; • case-based reasoning; • neural networks	• decision support systems; • data warehouse; • data mining; • business intelligence	• Internet; • intranet; • online learning; • knowledge databases and repositories; • knowledge routemaps and directories
Creating knowledge / explicit-to-tacit	• e-mail and messaging systems	• electronic meeting system; • chat systems; • application sharing systems; • shared whiteboards; • collaborative virtual environments; • video conferencing systems; • electronic project room; • electronic discussion systems; • co-authoring systems	• integrated document management	• work management systems; • expert systems; • constraint-based systems; • case-based reasoning; • neural networks	• decision support systems; • data warehouse; • data mining; • business intelligence	• Internet; • intranet; • online learning; • knowledge databases and repositories; • knowledge routemaps and directories; • knowledge networks and discussions

	Office applications	Groupware	Document systems	Work process systems	Analytical systems	Knowledge systems
Valuation of new explicit knowledge	Ø	Ø	Ø	Ø	Ø	• Internet; • intranet; • online learning; • knowledge databases and repositories; • knowledge routemaps and directories; • knowledge networks and discussions
Organizing & classifying assessed explicit knowledge		Ø	• integrated document management	Ø	Ø	• Internet; • intranet; • online learning; • knowledge databases and repositories; • knowledge routemaps and directories
Storing structured explicit knowledge			• integrated document management; • document imaging		• data warehouse; • business intelligence	• Internet; • intranet; • online learning; • knowledge databases and repositories; • knowledge routemaps and directories
Maintaining and refining stored explicit knowledge			• integrated document management		• data warehouse; • business intelligence	• Internet; • intranet; • online learning; • knowledge databases and repositories; • knowledge routemaps and directories
Distributing stored explicit knowledge	Ø	Ø	• integrated document management	Ø	• business intelligence	• Internet; • intranet; • online learning; • knowledge databases and repositories; • knowledge routemaps and directories
Accessing stored explicit knowledge		• electronic project room; • electronic discussion systems; • co-authoring systems	• integrated document management	• work management systems; • expert systems; • constraint-based systems; • case-based reasoning; • neural networks	• decision support systems; • data warehouse; • data mining; • business intelligence	• Internet; • intranet; • online learning; • knowledge databases and repositories; • knowledge routemaps and directories

	Office applications	Groupware	Document systems	Work process systems	Analytical systems	Knowledge systems
Using explicit knowledge	• e-mail and messaging systems; • calendaring and scheduling; • personal productivity applications	• electronic meeting system; • chat systems; • application sharing systems; • shared whiteboards; • collaborative virtual environments; • video conferencing systems; • electronic project room; • electronic discussion systems; • co-authoring systems	• integrated document management; • document imaging	• work management systems; • expert systems; • constraint-based systems; • case-based reasoning; • neural networks; • electronic forms	• decision support systems; • data warehouse; • data mining; • business intelligence	• Internet; • intranet; • online learning; • knowledge databases and repositories; • knowledge routemaps and directories; • knowledge networks and discussions
Using tacit knowledge	• e-mail and messaging systems; • calendaring and scheduling; • personal productivity applications	• electronic meeting system; • chat systems; • application sharing systems; • shared whiteboards; • collaborative virtual environments; • video conferencing systems; • electronic project room; • electronic discussion systems; • co-authoring systems	• integrated document management; • document imaging	• work management systems; • expert systems; • constraint-based systems; • case-based reasoning; • neural networks; • electronic forms	• decision support systems; • data warehouse; • data mining; • business intelligence	• Internet; • intranet; • online learning; • knowledge databases and repositories; • knowledge routemaps and directories; • knowledge networks and discussions

Table C.1: Knowledge sharing processes versus ICT tools

D AN INSTRUMENT FOR ASSESSMENT

In this appendix we describe an instrument that may help to indicate the level of knowledge sharing in an organization. We comment that the outcomes of this instrument may suggest an exactness that — due to the nature of our research subject — does not hold in practice. However, considering the primary objective of this dissertation (to understand and gain insight into conditions related to knowledge sharing in an organization), we developed a hands-on approach to try to make knowledge sharing more tangible.

First we present the basic formula of this instrument. Next we propose a ranking of the enabling conditions to indicate a possible difference in the significance of these conditions for knowledge sharing. This ranking takes the knowledge sharing strategy — codification or personalization — of the organization at hand into account. We also calculate minimum, maximum, and threshold values for each knowledge sharing phase that we identified in our prescriptive conceptual model.

Using our formula, the ranking, a pragmatic assessment of the fulfillment of the existing conditions, and the intervals for the knowledge sharing phases, we can derive — for the organization under study — the applicable knowledge sharing phase.

D.1 The basic formula

Our formula for assessment is constructed from the conditions that facilitate knowledge sharing as identified in the preceding chapters, and which are listed in Table 6.3 (on page 111).

$$Indication\_of\_the\_Level\_of\_Knowledge\_Sharing = f(Conditions)$$

We define the indication of the level of knowledge sharing in an organization as determined by a function of its enabling conditions. Multiplication of (the value of) these enabling conditions implies that all conditions contribute to knowledge sharing, and it also shows that a low score on one condition significantly reduces the overall level of knowledge sharing. However, in order to damp a perhaps too strong propagation of a change in a condition we propose to use the logarithm function, which is of a slowly increasing nature. In this respect a useful property of the logarithm function is the following:

$$\log\left(Condition_i \times Condition_j\right) = \log Condition_i + \log Condition_j, \quad i, j \geq 1$$

When we thereby choose to assess all conditions in the closed interval of 1 to 10, the logarithm function results in a value that falls in the closed interval of 0 to 1 (that we consider to be of practical value in our arithmetic operations):

$$Condition_i \in [1, 10] \quad \Rightarrow \quad \log Condition_i \in [0, 1], \quad i \geq 1$$

Because we want to create a possibility to indicate a possible variance in significance of these enabling conditions, we associate weights (i.e. coefficients) to these conditions. This results in our basic formula:

$$Indication\_of\_the\_Level\_of\_Knowledge\_Sharing = \sum_{i=1}^{n} \lambda_i \cdot \log Condition_i$$

When we rank the enabling conditions, we can arrange the coefficients in an ordinal scale:

$$\lambda_1 > \lambda_2 > \ldots > \lambda_k > \ldots > \lambda_n, \quad k \in \{1..n\}$$

Because they are all weights, we define the sum of these coefficients as equal to 1:

$$\sum_{i=1}^{n} \lambda_i = 1$$

And applying the expression:

$$1 + 2 + \ldots + n = \frac{1}{2} \cdot n \cdot (n+1)$$

Gives the following ordinal value for an arbitrary coefficient:

$$\lambda_k = \frac{n-k+1}{\frac{1}{2} \cdot n \cdot (n+1)}, \quad k \in \{1..n\}$$

The minimum value of our basic formula is 0 and the maximum value equals 1:

$$\underset{i=1..n}{\forall} Condition_i = 1 \quad \Rightarrow \quad \underset{i=1..n}{\forall} \log Condition_i = 0 \quad \Rightarrow$$

$$Indication\_of\_the\_Level\_of\_Knowledge\_Sharing = \sum_{i=1}^{n} \lambda_i \cdot 0 = 0 \Leftrightarrow \min$$

$$\underset{i=1..n}{\forall} Condition_i = 10 \quad \Rightarrow \quad \underset{i=1..n}{\forall} \log Condition_i = 1 \quad \Rightarrow$$

$$Indication\_of\_the\_Level\_of\_Knowledge\_Sharing = \sum_{i=1}^{n} \lambda_i \cdot 1 = 1 \Leftrightarrow \max$$

D.2 Ranking of the social, organizational, and technological conditions

In this section we propose a ranking of the nineteen enabling conditions that we identified in Chapter 5 (on page 65). This ranking indicates a difference in the significance of these conditions for knowledge sharing. We use Table 6.3 (on page 111) to establish this ranking. We propose to cluster the conditions according to their perceived motivational, cultural, or instrumental nature. We argue that conditions that are focused on motivational aspects bear the most significance on knowledge sharing because when people are not motivated to participate, any knowledge sharing program will most likely fail. And we consider conditions of a cultural nature to have more impact on knowledge sharing than instrumental

conditions, because we regard these instrumental conditions in the sense that was given in the description of the model of Orlikowski (see Section 3.4 on page 28): as a facilitator or medium of human action, and when the environment is not conducive to knowledge sharing there is no human action to facilitate.

This means that the motivational conditions: appraisal, care, and competence leverage will have the highest ranking. The cultural conditions: empowerment, trust, climate of openness, collaboration, community, dialogue, learning organization, organically structured organization, and slack come — with respect to ranking — after that. The lowest ranking will be held by the instrumental conditions: knowledge crew, knowledge champion, metric, system integrated into daily workprocess, collaborative platform, knowledge repository, and knowledge routemap.

We detail this ranking using the sequence of the knowledge sharing phases, because knowledge sharing in phase$_i$ builds on knowledge sharing in phase$_{i-1}$. This sequence is not the same for the two types of knowledge sharing strategy (see Figure 6.1 on page 102). In addition, we use the positioning of the conditions in each matrix-cell of Table 6.3, because (as mentioned in Section 6.9 on page 102) this order also indicates an influence on knowledge sharing relative to the other conditions in this matrix-cell. We resolve conflicts (where more than one condition will end up with the same ranking) by considering the type of these conditions (social, organizational, and technological) and we apply the same reasoning as above to define which condition has more significance to knowledge sharing: in this view social conditions rank higher than organizational conditions, which in their turn rank higher than technological conditions.

For a codification strategy we establish the ranking (from highest to lowest) of the enabling conditions as follows: appraisal, competence leverage (both are motivational conditions and are also both related to the first, i.e. the knowledge repository phase, therefore we use the sequence as given in the respective matrix-cell of Table 6.3), care (a singular motivational condition linked to the collaborative platform phase), slack (a solitary cultural condition associated with the knowledge repository phase), trust, empowerment, climate of openness, dialogue, community, collaboration (these six cultural conditions are all related to the collaborative platform phase, but trust and empowerment are social conditions, therefore they rank higher as the other four — organizational — conditions), organically structured organization, learning organization (two cultural conditions associated with the organizational learning phase), system integrated into daily workprocess, knowledge repository (both are instrumental conditions related to the knowledge repository phase, but the knowledge repository is a technological condition and therefore ranks lower), knowledge crew, knowledge champion, metric, knowledge routemap (all six are instrumental conditions associated with the knowledge routemap phase, but we take into account that the knowledge crew is a social condition, the knowledge champion and metric are organizational conditions, and the knowledge routemap is a technological condition), and collaborative platform.

The ranking in a personalization strategy is determined in the following way: care, appraisal, competence leverage (all three are motivational conditions related to the initial, collaborative platform phase, we therefore use the sequence as given in the respective matrix-cell of Table 6.3), trust, empowerment, climate of openness, slack, dialogue, community, collaboration (all seven conditions are of a cultural nature and linked to the collaborative platform phase, but trust and empowerment are social conditions and for that

reason are given a higher ranking than the other five — organizational — conditions), organically structured organization, learning organization (two cultural conditions associated with the organizational learning phase), knowledge champion, collaborative platform (both conditions are instrumental and related to the collaborative platform phase, but knowledge champion is an organizational condition and collaborative platform a technological condition), knowledge crew, metric, knowledge routemap (all three are instrumental conditions and associated with the knowledge routemap phase, though knowledge crew is a social condition, metric is an organizational condition, and the knowledge routemap is a technological condition), system integrated into daily workprocess, and knowledge repository (these are both instrumental conditions linked to the knowledge repository phase, but the condition system integrated into daily workprocess is an organizational condition).

We can summarize our ranking method as follows: we rank the enabling conditions differently for the two types of knowledge sharing strategy. We first consider the motivational, cultural, or instrumental nature of a condition. Subsequently we take the knowledge sharing phase of that condition into account and use the relative importance of that condition. If necessary, we also consider the type of a condition (whether it is social, organizational, or technological).

D.3 Definition of knowledge sharing phase intervals

In this section we will derive — for each knowledge sharing phase — an interval that gives an upper and lower limit of the level of knowledge sharing in that phase. We therefore divide the interval of [0, 1] of the basic formula into intervals associated with the knowledge sharing phases. For each phase we will derive its interval using the ranking of the most appropriate conditions for this phase (exactly as we defined in Table 6.3 on page 111), where the ranking is indicated by the ordinal number.

Since the number of identified enabling conditions is 19, we have the following ordinal value for an arbitrary coefficient (as shown above):

$$\lambda_k = \frac{20-k}{190}, \quad k \in [1,19]$$

When we apply the ranking as defined in the previous section, we can write our basic formula as a scalar product of two vectors in a 19-dimensional space: the coefficients are multiplied with the log function of the ranked conditions.

The vector that arranges the coefficients in an ordinal scale is as follows:

$$\left(\frac{19}{190}\ \frac{18}{190}\ \frac{17}{190}\ \frac{16}{190} \cdots \frac{4}{190}\ \frac{3}{190}\ \frac{2}{190}\ \frac{1}{190}\right)$$

The vector that consists of the ranked conditions, for a codification or personalization strategy respectively, is presented below:

$$\log \begin{pmatrix} \textit{appraisal} \\ \textit{competence leverage} \\ \textit{care} \\ \textit{slack} \\ \textit{trust} \\ \textit{empowerment} \\ \textit{climate of openness} \\ \textit{dialogue} \\ \textit{communities} \\ \textit{collaboration} \\ \textit{organically structured organization} \\ \textit{learning organization} \\ \textit{integrated into daily workprocess} \\ \textit{knowledge repository} \\ \textit{knowledge crew} \\ \textit{knowledge champion} \\ \textit{metrics} \\ \textit{knowledge routemap} \\ \textit{collaborative platform} \end{pmatrix} \qquad \log \begin{pmatrix} \textit{care} \\ \textit{appraisal} \\ \textit{competence leverage} \\ \textit{trust} \\ \textit{empowerment} \\ \textit{climate of openness} \\ \textit{slack} \\ \textit{dialogue} \\ \textit{communities} \\ \textit{collaboration} \\ \textit{organically structured organization} \\ \textit{learning organization} \\ \textit{knowledge champion} \\ \textit{collaborative platform} \\ \textit{knowledge crew} \\ \textit{metrics} \\ \textit{knowledge routemap} \\ \textit{integrated into daily workprocess} \\ \textit{knowledge repository} \end{pmatrix}$$

In the Table D.1 below we propose indicative values for knowledge sharing phase intervals. We present this for both — codification and personalization — strategies. The table lists the conditions most appropriate to a certain phase (as defined in Table 6.3 on page 111), and all social, organizational, and technological conditions have the numerator of their ordinal number attached (which is derived from the vectors above).

To calculate the maximum value of an interval we assign each condition — that we defined most appropriate to this phase — its maximum value of 10, which results in a value of 1 for its logarithm function. Subsequently we add all ordinal numbers of these conditions to yield the maximum value. This result is used to calculate the threshold of the phase at hand. We choose the threshold to be 75% of this maximum value, but this percentage may be adapted to fit specific characteristics of an organization. This maximum value is also used to determine the upper limit of the phase at hand: it is added to the lower limit (which is the upper limit of the preceding phase). The lower limit of the first phase is 0, for this is the minimum value of the interval of the basic formula.

As an illustration, let us derive the maximum value for the knowledge repository phase under a codification strategy. In Table 6.3 (on page 111) we related five conditions with this phase: appraisal, competence leverage, slack, system integrated into daily workprocess, and knowledge repository. The ordinal numbers of these conditions are: $\frac{19}{190}, \frac{18}{190}, \frac{16}{190}, \frac{7}{190}, \frac{6}{190}$ respectively.
When we sum these ordinal numbers we get approximately 0.35 as the maximum value. This figure is subsequently used to calculate the threshold and the upper limit of the knowledge repository phase.

CODIFICATION STRATEGY						
Phase	**People**	**Organization**	**Technology**	**Maximum**	**Threshold**	**Interval**
Unawareness phase	none	none	none	not applicable	not applicable	not applicable
Knowledge repository phase	appraisal = 19 competence leverage = 18	slack = 16 system integrated into daily workprocess = 7	knowledge repository = 6	66/190 ≅ 0.35	0.26	[0 , 0.35)
Knowledge routemap phase	knowledge crew = 5	knowledge champion = 4 metric = 3	knowledge routemap = 2	14/190 ≅ 0.07	0.06	[0.35 , 0.42)
Collaborative platform phase	trust = 15 care = 17 empowerment = 14	climate of openness = 13 dialogue = 12 community = 11 collaboration = 10	collaborative platform = 1	93/190 ≅ 0.49	0.37	[0.42 , 0.91)
Organizational learning phase		organically structured organization = 9 learning organization = 8		17/190 ≅ 0.09	0.07	[0.91 , 1]
PERSONALIZATION STRATEGY						
Phase	**People**	**Organization**	**Technology**	**Maximum**	**Threshold**	**Interval**
Unawareness phase	none	none	none	not applicable	not applicable	not applicable
Collaborative platform phase	trust = 16 care = 19 appraisal = 18 competence leverage = 17 empowerment = 15	climate of openness = 14 slack = 13 dialogue = 12 community = 11 knowledge champion = 7 collaboration = 10	collaborative platform = 6	158/190 ≅ 0.83	0.62	[0 , 0.83)
Knowledge routemap phase	knowledge crew = 5	metric = 4	knowledge routemap = 3	12/190 ≅ 0.06	0.05	[0.83, 0.89)
Knowledge repository phase		system integrated into daily workprocess = 2	knowledge repository = 1	3/190 ≅ 0.02	0.01	[0.89 , 0.91)
Organizational learning phase		organically structured organization = 9 learning organization = 8		17/190 ≅ 0.09	0.07	[0.91 , 1]

Table D.1: Knowledge sharing phase intervals

We use this table to determine which knowledge sharing phase is applicable to the organization at hand, i.e. which phase — with its specific characteristics — typifies the development of the organization with respect to knowledge sharing.

We use the assessed value of all the conditions (as they are present in the organization) to derive an indication of the level of knowledge sharing. However, the resulting overall value is constructed from conditions that are related to different knowledge sharing phases. To be able to determine the phase that is applicable to this organization, we apply the thresholds as defined in Table D.1. We consider a phase 'fulfilled' when the actual value of the conditions related to that phase yield a value greater than or equal to its threshold. Because

knowledge sharing in phase$_i$ builds on knowledge sharing in phase$_{i-1}$ we always check the first phase (in case of a codification strategy this is the knowledge repository phase, in a personalization strategy this is the collaborative platform phase) to see whether it is fulfilled. If so, we check the next phase until the threshold of the phase under scrutiny can not be passed. The last fulfilled knowledge sharing phase is the phase applicable to the organization at hand.

D.4 An illustration

Let us illustrate this instrument for assessment with an example. Suppose organization *O* operates under a codification strategy. We assessed the degree of fulfillment of the enabling conditions in this organization as it is at this moment as follows: appraisal = 2, competence leverage = 5, care = 3, slack = 1, ….. , system integrated into daily workprocess = 3, ….. , knowledge repository = 6, knowledge routemap = 3, and collaborative platform = 6. In order to derive the overall level of knowledge sharing, we calculate the scalar product (as defined above):

$$\frac{19}{190}\cdot\log 2+\frac{18}{190}\cdot\log 5+\ldots+\frac{2}{190}\cdot\log 3+\frac{1}{190}\cdot\log 6=0.54$$

To determine which phase is applicable to organization *O*, we verify whether the first phase (the knowledge repository phase) is fulfilled:

$$\frac{19}{190}\cdot\log 2+\frac{18}{190}\cdot\log 5+\frac{16}{190}\cdot\log 1+\frac{7}{190}\cdot\log 3+\frac{6}{190}\cdot\log 6=0.14$$

This value is below the threshold of 0.26, which implies that the unawareness phase is applicable to organization *O*. Subsequently, Table 6.3 (on page 111) shows us the conditions that are most eligible to stimulate (using the suggestions that are mentioned in Table 7.2) in order to support a transition into the knowledge repository phase: appraisal, competence leverage, slack, system integrated into daily workprocess, and knowledge repository.

E AN APPROACH TO STEER STIMULATIONS OF ENABLING CONDITIONS

In Section 7.6 (on page 120) we presented possible stimulations of conditions that facilitate knowledge sharing. This appendix discusses an approach that may steer and support the efforts to realize these stimulations. The approach is appropriate for each knowledge sharing phase and is partitioned into four stages (Hartz et al., 2001; Elliott, 1997a) that we detail below:

- enter and advocate;
- experiment, assess, and pilot;
- plan, support, and deploy;
- expand and institutionalize.

E.1 Stage 1: enter and advocate

In this stage, an organization has identified which conditions are most appropriate to stimulate (in that organization with its specific maturity level with respect to knowledge sharing) and it will try to improve these conditions. A strategy needs to be developed that targets specific business objectives — in stead of "only general aspirations like share best practices or stimulate collaboration" — to ensure successful accomplishment of this task (Lucier and Torsilieri, 1997). A willingness to invest in required resources such as people, energy, time, and money should be demonstrated and communicated by management. Steps should be taken to inspire others to join these efforts. Emphasis should shift from controlling people to autonomy of employees and free flow of information. Communication of the all-encompassing belief that sharing and use of knowledge is advantageous for the employee and for the organization should occur on a continuing basis (Hartz et al., 2001).

E.2 Stage 2: experiment, assess, and pilot

In the previous stage the organization has laid a foundation for the stimulation of the enabling conditions. The current stage experiments with the most effective and practical way to realize this stimulation. Hartz et al. (2001) observe that activities may develop in isolated, grassroots initiatives, across organizational boundaries, or in corporate programs. These experiments should take into account three aspects that encourage social co-operation needed for knowledge sharing (Cabrera, 2000):

- when it is not so costly for people to contribute individually to the common good, the less likely they will be to withhold their contributions (for example in providing content to a knowledge repository);
- people are stimulated when they perceive an effect of their contribution, "the more clearly people can see the impact of their contributions, the more motivated they are to make the effort" (Cabrera, 2000);
- the size and composition of the group should be just right; small groups tend to enact social pressure mechanisms but the group size may not be enough to compensate individual efforts; on the other hand, when groups become too large, individu-

als may feel that their contributions do not make a difference and individual participation will also become hard to monitor and sanction.

At some point in time the results of these experiments are assessed to determine their impact (Hartz et al., 2001). This assessment may help to ascertain their degree of viability. The most viable experiments that improve the identified conditions can be subsequently run as a pilot, in a somewhat more formal and controlled environment. Hope and Hendry (1995) claim that viable experiments should offer people the ability to relate the new, desired behavior to their tasks and business performance.

At this stage some steering takes place and perhaps some corporate funding is supplied. Maybe sponsors arise who recognize the purpose and benefits gained from realizing one or more of these conditions, understand what needs to be done, can command the necessary resources, and are able to resolve organizational and priority conflicts (Elliott, 1997a).

E.3 Stage 3: plan, support, and deploy

In this stage the stimulation of the enabling conditions is realized in a more structured way. Project- and change management are used to undertake the activities that were shaped in the pilots and that demonstrated their feasibility.

Organizational values are formulated that visualize the key aspects of the goals to be attained with these activities. The members of the organization are informed and the key stakeholders are involved and motivated. Organizational structures are created, business functions and processes are modified, and flexible technologies and systems are implemented to enable the stimulation of the identified conditions (Garvin, 1993). Attention is paid to alignment of these conditions, as Elliott (1996) observes: "if you primarily recognize and reward individual performance, it's obviously going to be difficult to get sharing to occur across organizational boundaries."

An action plan is developed that — according to regular project planning techniques — should divide the activities into several, manageable phases: the orientation phase, objectives phase, definition phase, design phase, preparation phase, realization phase, verification phase, and aftercare phase.

Orientation phase

Investigate which experiments and pilots are underway and consider which initiatives that take place outside the organization may be of some value.

Objectives phase

Define which goals should be attained — now and in the near future — through stimulation of the identified condition(s): what needs to be improved, which areas benefit from stimulating the identified condition(s), who are the key stakeholders, what are their main frustration points, what are the benefits (not only financial but also quantitative (for instance growth) and qualitative (for example improved customer service)) and what are the costs, which resources can be employed, who can act as a sponsor, and whether external assistance is needed.

Definition phase

Demarcate the project and define the method to realize the goals, study the way things are done now and determine what needs to be changed, define a strategy for communicating the key aspects of the goals and the benefits obtained from the new way of work-

ing, identify the limits and constraints of the currently employed information and communication technology, initiate a project (define the project organization, milestones, start date, total project time, who does what and when, the costs involved, the possible project hazards and risks, the interdependencies with other projects, the information-, communication-, and reporting flows), draw up a project plan, and have this project plan agreed upon by management.

Define unambiguous milestones — and assign these to sponsors, where these milestones have to arrive at about six-month intervals, because visible results are necessary to demonstrate the viability of the activities and to stimulate participation.

Design phase

Concretize the exact stimulation of the identified condition(s). Define the method and estimate the social, organizational, and technological implications. Decide how to involve the stakeholders. Identify and organize the tasks, authorities, and responsibilities of the employees involved and set up educational programs where needed. Plan the necessary changes in organizational structure and the required information and communication technology infrastructure (address issues like connectivity, accessibility, standardization, proven technology, security, privacy, bandwidth, performance, maintainability, flexibility, stability, extensibility, and scalability).

Preparation phase

Prepare for a smooth realization of the planned activities. Adapt existing procedures and define new procedures to support the new way of working. Purchase the necessary infrastructure components. Hire external specialists if desired. Arrange the required training and instruction. Create material for promotion and communication. Institute a quality assurance program. Appoint, where required, employees in their new positions and take precautions that these employees and the key stakeholders are allowed sufficient time to adapt to the new situation.

Realization phase

Launch and roll-out the necessary activities for stimulation of the identified condition(s). Bring the changed and new procedures into operation. Install and tune the new infrastructure components. Communicate and report about the progress made. Engage and train the participants in the new way of working.

Verification phase

Check whether the intended goals are realized. Assess periodically to check progress and audit the effect of the activities undertaken in order to improve the results.

Aftercare phase

Solve the final problems and carry out an evaluation. Identify and describe the 'lessons learned'. Organize a celebration for all people involved.

E.4 Stage 4: expand and institutionalize

In this final stage, the activities with respect to the stimulation of the enabling conditions are implemented on an organization-wide scale (Hartz et al., 2001). Company-wide communication programs about and enterprise-wide training programs in the new way of working are carried out. The new way of working is embedded in all related business functions and processes of the organization.

F SAMENVATTING (SUMMARY IN DUTCH)

SOCIALE, ORGANISATORISCHE EN TECHNOLOGISCHE CONDITIES BIJ KENNISDELEN

Organisaties worden geconfronteerd met een continu toenemende dynamiek in hun omgeving. Het delen van kennis tussen medewerkers kan deze organisaties helpen hieraan het hoofd te bieden. Dit proefschrift onderzoekt welke condities mogelijk een rol spelen bij het faciliteren van dit kennisdelen. De hoofddoelstelling van het proefschrift is inzicht te verkrijgen in en begrijpen van die condities om organisaties te helpen effectiever te worden bij het kennisdelen. Onze studie richt zich op het ontwikkelen van theorie waarbij ook een relatie naar de praktijk getrokken wordt.

Het onderzoek combineert de theorie van Nonaka en Takeuchi (1995) over kennis creatie en het model van Orlikowski (1992) over de interactie tussen technologie en organisaties. Dit resulteert in een nadere uitwerking van de kennisdelingsprocessen in een organisatie èn in een toelichting op de drie entiteiten mens, organisatie en (informatie en communicatie) technologie en hun rol bij het delen van kennis.

Hoofdstuk 1 beschouwt de ontwikkelingen in onze maatschappij die mogelijk tot voornoemde dynamiek kunnen leiden. Voor organisaties die geconfronteerd worden met een dynamische omgeving is leren — dat wil zeggen kennisdelen — en aanpassen een kritieke succes factor om in de pas te kunnen blijven lopen. In dit proces speelt kennis een significante rol. Het begrip kennis wordt uitgelegd met behulp van definiëring van de concepten data, informatie en (expliciete en impliciete) kennis. We sluiten dit hoofdstuk af met een beschrijving van het probleem dat wij in dit proefschrift zullen bestuderen.

De onderzoeksvraag en het te realiseren onderzoeksdoel worden beschreven in Hoofdstuk 2. Het blijkt lastig voor organisaties om een omgeving te creëren en te behouden die kennisdelen stimuleert. Condities dienen geschapen te worden waardoor mensen samen kunnen werken, elkaar kunnen vertrouwen en ideeën kunnen uitwisselen. Het doel van dit proefschrift is om de condities die het delen van kennis bevorderen te identificeren en te begrijpen. Daarom stellen we de volgende onderzoeksvraag: "*Welke condities bevorderen het delen van kennis tussen mensen in een organisatie?*" en koppelen daaraan het onderzoeksdoel: "*Identificeer de relevante condities die het delen van kennis tussen mensen in een organisatie bevorderen.*"

De aanpak van het onderzoek bestaat uit een filosofie, strategie en instrument. Vanwege het verkennende karakter van ons onderzoek kiezen we het interpretivisme als onderliggende onderzoeksfilosofie. Hierop gebaseerd hebben we de inductief-hypothetische model cyclus als onderzoek strategie gehanteerd. Deze cyclus beschouwt zowel de theoretische en praktische als ook de beschrijvende en normatieve aspecten van onze studie. Binnen dit raamwerk is als onderzoeksinstrument gekozen voor casus onderzoek.

In Hoofdstuk 3 breiden we de theorie inzake kennis creatie van Nonaka en Takeuchi (1995) uit met het verwerken van gecodificeerde of expliciete kennis. Dit leidt tot bepaling van processen welke relevant kunnen zijn voor kennisdeling in een organisatie. Hierbij zijn de volgende kennisdelingsprocessen geïdentificeerd: creëren van kennis — impliciet-naar-impliciet, impliciet-naar-expliciet, expliciet-naar-impliciet en expliciet-naar-expliciet —,

evaluatie van nieuwe expliciete kennis, structureren en classificeren van geëvalueerde expliciete kennis, opslaan van gestructureerde expliciete kennis, onderhouden en verfijnen van opgeslagen expliciete kennis, distribueren van opgeslagen expliciete kennis, raadplegen van opgeslagen expliciete kennis, gebruiken van expliciete kennis en gebruiken van impliciete kennis.

We bespreken het model van Orlikowski (1992) — dat de invloeden en interactie beschrijft van mens, organisatie en technologie, omdat we deze drie entiteiten beschouwen als sleutel factoren bij het delen van kennis. Voor wat betreft de menselijke factor worden de beweegredenen van de mens onderzocht, evenals de mogelijke vaardigheidsniveaus van een medewerker in een organisatie en de rol die iemand in een bedrijf kan spelen. Organisatorische dimensies worden geanalyseerd met behulp van het 7S raamwerk van McKinsey, dat uit zeven aan elkaar gerelateerde factoren bestaat: strategie, structuur, systemen, personeel, vaardigheden, stijl en cultuur. De technologie factor en de mogelijkheden die de (informatie en communicatie) technologie biedt om het delen van kennis te faciliteren, worden gedetailleerd via een groepering op functionaliteiten: kantoor applicaties, groupware, document systemen, werkproces systemen, analytische systemen en kennis systemen.

Twee verschillende typen organisaties worden in Hoofdstuk 4 geanalyseerd met behulp van de invloed die de menselijke, organisatorische en technologische factor op hun kennisdelingsprocessen heeft. We identificeren condities waardoor het delen van kennis mogelijk onderdeel kan gaan uitmaken van de manier van werken in deze organisaties.

Hoofdstuk 5 beschrijft de — naar onze mening meest relevante — condities die kennisdelen in een organisatie faciliteren. Deze condities zijn onderverdeeld naar sociale, organisatorische en technologische factoren:

sociaal:	zorg, vertrouwen, empowerment, hefboomwerking bekwaamheid, waardering en kennis-team;
organisatorisch:	klimaat van openheid, dialoog, gemeenschap, organisch gestructureerde organisatie, teamwork, lerende organisatie, speling, kennis kampioen, in werkproces geïntegreerd systeem en meting;
technologisch:	kennis opslag, kennis atlas en samenwerkingsplatform.

In Hoofdstuk 6 argumenteren we dat de ontwikkeling van een organisatie — met betrekking tot het delen van kennis — gekenmerkt kan worden door een aantal fasen. We onderscheiden hierbij de volgende fasen: de onbewuste fase, kennis opslag fase, kennis atlas fase, samenwerkingsplatform fase en organisatorisch leren fase.

We stellen een model op, met daarin vervat de codificering of personalisatie kennisdelingsstrategie waaronder een organisatie opereert. Ons model bestaat daarom uit twee matrices — een voor elk type strategie — waarin de verschillende kennisdelingsfasen gerelateerd worden aan de sociale, organisatorische en technologische condities die daarop het meest van toepassing zijn (zie de hierna volgende tabel).

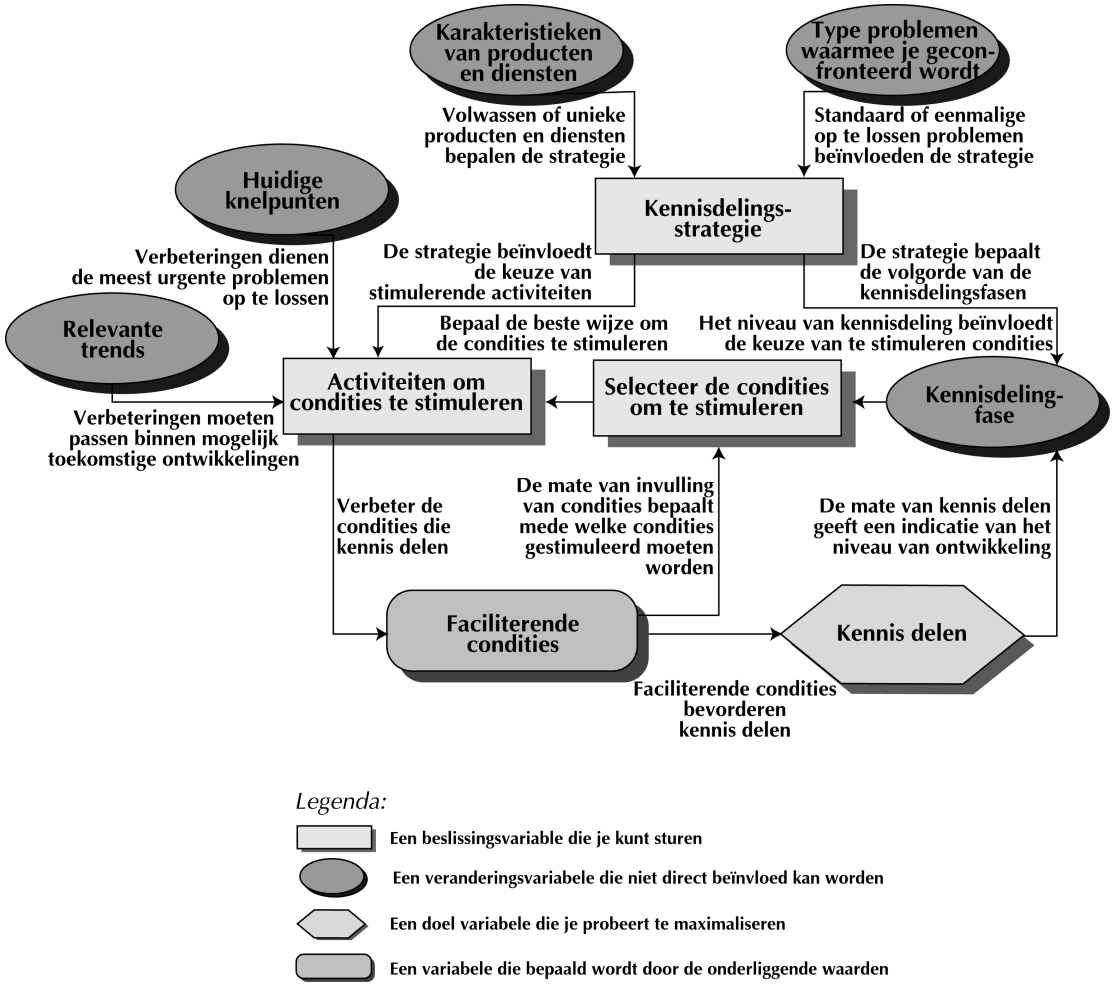
CODIFICERING STRATEGIE			
	Mensen	**Organisatie**	**Technologie**
Onbewuste fase	geen		
Kennis opslag fase	waardering, hefboomwerking bekwaamheid	speling, in werkproces geïntegreerd systeem	kennis opslag
Kennis atlas fase	kennis-team	kennis kampioen, meting	kennis atlas
Samenwerkings-platform fase	vertrouwen, zorg, empowerment	klimaat van openheid, dialoog, gemeenschap, teamwork	samenwerkingsplatform
Organisatorisch leren fase		organisch gestructureerde organisatie, lerende organisatie	

PERSONALISATIE STRATEGIE			
	Mensen	**Organisatie**	**Technologie**
Onbewuste fase	geen		
Samenwerkings-platform fase	vertrouwen, zorg, waardering, hefboomwerking bekwaamheid, empowerment	klimaat van openheid, speling, dialoog, gemeenschap, kennis kampioen, teamwork	samenwerkingsplatform
Kennis atlas fase	kennis-team	meting	kennis atlas
Kennis opslag fase		in werkproces geïntegreerd systeem	kennis opslag
Organisatorisch leren fase		organisch gestructureerde organisatie, lerende organisatie	

In Hoofdstuk 7 presenteren we een proces van inschatten en actie (zie de figuur op de volgende bladzijde) waarmee we ons normatieve conceptueel model implementeren. Hierbij definiëren we actie als het verbeteren van de van toepassing zijnde condities. Door het inschatten van de mate van invulling van de condities zoals deze in een organisatie aanwezig zijn, voorafgaand aan en enige tijd nadat een conditie gestimuleerd is, kan een verandering in de mate van kennisdeling in een organisatie zichtbaar worden. Deze ingeschatte verandering kan een indicatie opleveren van de effectiviteit van (een of meerdere) condities in het bevorderen van kennisdeling.

Het proces van inschatten en actie is gebaseerd op een pragmatische inschatting van de mate van invulling van de condities die het delen van kennis bevorderen. Dit stelt ons in staat om een indicatie van het niveau van kennisdeling in een organisatie te verkrijgen. Gegeven de van toepassing zijnde kennisdelingsstrategie, stelt deze indicatie ons in staat om de van toepassing zijnde kennisdelingsfase te bepalen voor de betrokken organisatie.

Aan elke kennisdelingsfase zijn condities gekoppeld, welke bij uitstek geschikt zijn om gestimuleerd te worden. Aan de hand van de van toepassing zijnde fase en de mate van invulling van de hierbij horende condities besluiten we om de huidige kennisdelingsfase te versterken of om een transitie naar de volgende fase te bewerkstelligen. We zetten huidige organisatorische knelpunten af tegen te verwachten toekomstige ontwikkelingen om te identificeren op welke wijze de stimulatie van de condities ingevuld kan worden. Het effect van deze stimuleringen kan vervolgens ingeschat worden, wat aanleiding kan vormen tot verdere actie.



In Hoofdstuk 8 beschrijven we de implementatie van ons normatieve conceptueel model via een proces van inschatten en actie voor drie verschillende casussen: Getronics Consulting, het Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer en Unilever Research & Development.

In Hoofdstuk 9 evalueren we ons normatieve empirisch model. We passen onze ervaringen uit het implementeren van het proces van inschatten en actie in drie afwijkende organisaties toe om na te gaan of ons model overeenkomt met de primaire doelstelling van deze dissertatie: het inzicht te verkrijgen in de condities die organisaties helpen effectiever te worden bij het kennisdelen.

Tevens gaan we nader in op de validatie van ons model met behulp van een aantal expert interviews. Deze experts zijn materie deskundigen die geacht worden voldoende competentie te bezitten om een geaccepteerd wetenschappelijk oordeel over ons model uit te kunnen spreken. De expert interviews zijn er op gericht om na te gaan of het model strookt met waarnemingen uit de praktijk.

Dit hoofdstuk bevat bovendien een verbeterde versie van ons model, gebaseerd op het commentaar van de materie deskundigen en onze ervaringen opgedaan bij het implementeren ervan.

In Hoofdstuk 10 presenteren we een evaluatie van onze studie, doen we suggesties voor verder onderzoek en sluiten we het proefschrift af. De belangrijkste uitkomsten van ons onderzoek kunnen we als volgt samenvatten:

- een bijdrage aan het theoretisch kader inzake de voorwaarden ten aanzien van het delen van kennis in organisaties en een verbeterd inzicht in de processen welke van belang zijn bij het delen van impliciete en expliciete kennis;
- de identificatie van sociale, organisatorische en technologische condities die het delen van kennis in een organisatie bevorderen en de definiëring van fasen, die een zeker moment in de ontwikkeling van kennisdeling in een organisatie weergeven;
- een beschrijving van een proces van inschatten en actie dat op maat gesneden activiteiten kan identificeren om het kennisdelen in een organisatie te kunnen verbeteren.

We benadrukken dat het delen van kennis een complex gebeuren is, dat door talrijke factoren beïnvloed wordt. De realiteit wordt geweld aangedaan indien beweerd wordt dat er een enkele, specifieke oplossing zou bestaan. In ons onderzoek hebben we een raamwerk bepaald van condities die relevant zijn voor het delen van kennis. Wij stellen dat het delen van kennis tussen mensen verankerd is in de manier van denken en in de manier van werken, en dat dit bevorderd kan worden door het stimuleren van de juiste sociale, organisatorische en technologische condities.

Paul van den Brink

G CURRICULUM VITAE AUTHOR

Paul van den Brink was born in Amsterdam, the Netherlands on May 2nd 1956. His initial education took place at primary and secondary schools in his town of birth. Paul studied Computer Science (Informatica) at the Free University of Amsterdam from 1981 until his graduation in 1986.

After his study he worked for Philips, the electronics multinational, in Eindhoven from 1986 to 1991. Here Paul held several research and management positions in the field of information and communication technology. In 1991 he switched to consultancy. As a consultant Paul realized several assignments in the area of knowledge management, re-engineering of business processes, strategic information planning, project management, and change management.

In 1993 Paul received the degree Master of Business Administration from the University of Diepenbeek (Post Universitair Centrum), Belgium.

From 1997 up to 2003 Paul carried out this research — in combination with his full-time job — at the Faculty of Technology, Policy, and Management at the Delft University of Technology.