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**Does Organisational Culture Affect the Sharing of
Knowledge?**

**The Case of a Department in a High-Technology
Company**

by
Hans-Georg Gruber, cand.-ing.

**A thesis submitted to
The Faculty of Graduate Studies and Research
In partial fulfilment of
The requirements for the degree of**

Master of Management Studies

**Carleton University
Ottawa, Ontario
February 2000**

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KNOWLEDGE?
THE CASE OF A DEPARTMENT IN A HIGH-TECHNOLOGY
COMPANY**

submitted by
Hans-Georg Gruber cand.-ing. (Vordiplom)
in partial fulfilment for the requirements for
the degree of Masters of Management Studies

Director, School of Business

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February 2000

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1 Abstract

Lately many companies have invested huge amounts of time and money into knowledge management systems. Research would suggest that one critical factor for the success of such systems is the culture of sharing knowledge (Davenport et al. 1998) as only those people who are willing to share their knowledge, will transfer their knowledge through knowledge management systems.

Nobody has yet looked in detail at those aspects of organisational culture that influence the sharing of explicit and tacit knowledge. This has been done in this thesis. From the research in the areas of organisational culture, knowledge management, and intraorganisational trust five factors have been identified that influence the construct "culture of sharing knowledge." These five factors are: openness, trust, availability and use of communication channels, top management support of knowledge sharing, and a reward system linked to the sharing of knowledge.

To research these factors of organisational culture a case study approach was used to examine the culture of knowledge sharing in the R&D department of a high-tech firm. Twenty-nine person in-depth interviews were conducted. The response frequencies to the 52 questions were counted and the answers were analysed for between group differences (years of service and job type).

The results suggest that there does exist an ideal of a culture that truly supports the sharing of knowledge. Furthermore, all of the five factors included in this study appear to influence the sharing. The reward system in the organisation appears to be a key component of a culture which supports the sharing of knowledge. The results indicated that a reward system that supports the sharing of knowledge should be designed to reward openness especially from experts, through recognition from peers and formal acknowledgement through peers. As a consequence organisations should focus on understanding and supporting the 'culture' that supports the sharing of knowledge rather than the technology that allows sharing (i.e. focus on people not system).

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2 Introduction

Given the hype surrounding the term "knowledge management", there can surely be few managers who have not encountered that term. In the past years the number of books, reports, conferences and web sites devoted to the subject of knowledge management has spiralled leaving little doubt that it is a topic of interest to many. Therefore, the rapid creation and diffusion of knowledge within and between companies has become a top priority issue on managers' agendas (Nelson and Coopride 1996).

Quintas et al. (1997 p.387) define knowledge management as the following:

"Knowledge management is the process of continually managing knowledge of all kinds to meet existing and emerging needs, to identify and exploit existing and acquired knowledge assets and to develop new opportunities."

This means that knowledge management should provide a systematic way to make knowledge available when and where it is needed. Knowledge management has implications at all organisational levels and functions; thus culture, people, process and technology have all to be considered (Demarest 1997). In other words effective knowledge management does not only depend on the technology; it also depends on people.

The expected benefit of a knowledge management system (KMS) is to use knowledge more effectively (Davenport et al. 1998). Jordan and Jones (1997) identify several benefits of KMSs including enhanced problem-solving, and a more efficient use of manpower (i.e. the same problem within a firm should not be solved at the same time by different teams of individuals.) Another benefit of KMS identified by Jordan and Jones

(1997) is the support for dissemination of knowledge throughout the company. KMS should help to store and retrieve organisational knowledge more easily (Wah 1999).

Many 'solutions' to knowledge management have been purely technical implementations of highly complicated and expensive knowledge management systems (Geraint 1998). This has led to disillusionment about these IT based knowledge management systems as the IT systems could not deliver what they promised (Reimus 1997). As Geraint (1998 p.44) states: "It should come as no surprise ... that chief among these is the realisation that too much faith has been invested in technology at the expense of people issues." According to Davenport (1994 p.120): "too many managers still believe that once the right technology is in place, appropriate information sharing will follow." Davenport (1994) stresses, that people don't share knowledge and information easily. He notes that one of the biggest mistakes executives make are the assumptions they have about any IT system. They assume wrongly, that different departments, professionals, or line workers will want to use technology to share knowledge. To summarise, many KMSs have been unsuccessful, because they overemphasise technology and forget the human dimension (Davenport 1998).

Giovanni Piazza, a developer of knowledge management systems at Ernst & Young, has described these challenges succinctly: "If people don't want to share, they are not going to do it even if you have the best technology in the world. People won't share if they don't see what's in it for them." (HBR case study D Garvin 1997 p.20).

So the question is, what are the factors that make a knowledge management project successful? In researching this question Davenport et al. (1998) point out the most important factor appears to be an organisational culture that is aware of the importance of knowledge and that supports the sharing and distribution of knowledge. As Geraint (1998

p.46) says: "What really matters is getting employees to share their insights and experience." This thesis will examine the key question coming out of the work by Davenport et al. (1997, 1998) "What factors of an organisational culture are critical for the sharing of knowledge?"

Although the literature has stressed the importance of an organisational culture that supports knowledge exchange, to our knowledge nobody has yet looked at this topic in further detail. Therefore this thesis will help to close a gap in the research literature by analysing the aspects of organisational culture that influence the sharing of knowledge.

An organisation's culture consists of its norms and values and they act as a social control system (Schein 1996). The norms and values of an organisation govern the behaviour of the individuals. As Tushman and O'Reilly (1997 p.92) state: "The informal patterns of interaction drive a firm's informal structure, power, and communication networks... While culture can facilitate innovation, it can also get in the way."

This definition of culture would imply that the values and beliefs that define the culture should also strongly influence the communication and the transfer of knowledge. Studies of organisational culture, in most cases, however are interested in describing the whole picture of an organisational culture. This is not of interest here. For this thesis only those values and beliefs which the literature suggests might influence the sharing of knowledge are considered. While there is large body of research that examines the organisational culture as a whole, to our knowledge no research has been done specifically on those aspects of the culture of an organisation that enhance or hinder knowledge sharing. This thesis will 'zoom in' on a number of possible factors. This forces should further our theoretical understanding of how culture fits into models of knowledge management.

The outcome of this research should benefit both academics and practitioners. As the factors of the organisational culture that affect the knowledge sharing are better understood, the cultural aspects concerning knowledge sharing can be influenced. This should help organisations successfully implement knowledge management systems. Moreover, the information from this thesis should help practitioners to reap the full benefits of an existing knowledge management system. Managers should be able to increase the value of their current knowledge management system and create and transfer knowledge more easily with the results gained from this thesis. The company studied will get a better understanding of the most important factors that influence those aspects of their organisational culture that impact knowledge sharing. With these insights they, (hopefully) will be able to manage their knowledge transfer better and more effectively.

The field to be researched is relatively new and the construct to be analysed, organisational culture, is not easily quantified. To accomodate this, qualitative research methods will be used in this thesis. Specifically an in depth case study of knowledge sharing in the R&D department of a high-tech firm will be conducted.

2.1 Objective

The goal of this thesis is to get an in-depth understanding of how the organisational culture influences the sharing of knowledge. The specific objectives are to: (1) better understand the factors that make-up a culture of sharing knowledge, and (2) understand how the identified factors relate to the sharing of explicit and tacit knowledge.

This thesis begins in chapter three with three part literature review. Part one of the literature review will examine the topic of knowledge. Part two will review the relevant

literature concerning organisational culture. Part three will give details on the research model guiding this investigation. Chapter four states the research questions. Chapter five deals with the methodology to be used in this thesis. Topics to be discussed in this chapter include justifications for the decision to use qualitative research and a case study approach. Other topics include how the in-depth interview will be structured and how the data gathered will be analysed. In chapter six the results are presented and discussed. Chapter seven tries to give a conclusion from the results obtained. In the eight and final chapter the benefits and the imitations of this research will be reconsidered.

3 Literature Review

This thesis bridges the gap between the literature about knowledge management and the research being done about organizational culture. The aim of this literature review is to marry these two literatures in order to gain a better understanding of what is meant by a “culture of sharing knowledge.”

To meet these goals the chapter is divided into three parts where relevant concepts identified in the literature will be discussed. The first part of this chapter deals with those aspects about knowledge that are important for this thesis. In the second part the pertinent concepts of organisational culture will be explained. The third part starts with a model. The model introduces those aspects of the construct “culture of sharing knowledge” to be examined in this thesis and their relationship to the sharing of knowledge. This is followed by a discussion of the factors that are used in this thesis to operationalize the construct “culture of sharing knowledge”.

3.1 Knowledge

It is important to distinguish knowledge as distinct from data or information. Data are raw facts, sometimes useful to few. Only when data is classified, summarised, transferred or corrected to add value, does it become information within a certain context (Hackbarth and Grover 1999). According to Hackbarth and Grover (1999) knowledge is a higher order concept than either data or information.

As Nonaka (1994 p.15) states:

“In short, information is a flow of messages, while knowledge is created and organised by the very flow of information, anchored on the commitment and

beliefs of its holder. This understanding emphasises an essential aspect of knowledge that relates to human action.”

To share knowledge means more than to communicate. As Keen, 1988 notes, shared knowledge goes beyond the basic informational level. To go beyond the informational briefing stage a common language is required (Nonaka 1994). Shared knowledge must be expressed in words or symbols that are common to the social domain of both employees (Zeleny 1989). Such a shared language can facilitate knowledge transfer. It can also create a positive social influence process (Pondy 1978). Thus, to share knowledge, it is necessary to develop an appreciation and understanding of the other’s environment and context rather than merely sharing information and communicating technical and procedural terms (Henderson 1990). Within this set of definitions, communication can be seen to be only a means to and facilitator of shared knowledge (Bostrom 1989). As von Krogh(1998 p. 135) states:

“Personal knowledge has to be made explicit in a language that is known and acceptable to the team members and to the company. However, some personal knowledge can only be expressed by using words that are unknown. Recognition of new business opportunities might require an innovative vocabulary such as ‘infotainment’, ‘edutainment’ or ‘cybershopping.’”

It is important to distinguish between two types of knowledge: tacit and explicit (Nonaka 1995). Explicit knowledge refers to knowledge that is codified and therefore transmittable via documents and formal, systematic language. It is captured in records of the past such as libraries, archives, and databases and is assessed on a sequential basis (Garvin 1997). Tacit knowledge on the other hand, “has a personal quality, which makes it hard to formalise and communicate. Tacit knowledge is deeply rooted in action, commitment, and involvement in a specific context” (Nonaka 1994 p.16). It resides in the

minds of the people in an organization but has not been put in structured, document-based form (Davenport et al. 1998). Nonaka (1994) states that tacit knowledge involves both cognitive and technical elements. Human beings form “mental models” to make up working models of the world by creating and manipulating analogies in their minds. Parts of these working models are schemata, paradigms, and viewpoints that provide a perspective on how individuals see their world. Technical elements, on the other hand, include concrete know-how, crafts, and skills for specific contexts. According to Nonaka (1995) both aspects have to be shared to create new knowledge.

Research would suggest that the success of knowledge management depends not only on how effectively the diverse individuals are able to organise and develop their unique knowledge competencies, but also how they can integrate and utilise their distinctive knowledge both effectively and synergistically (Dougherty, 1992). Duncan and Weiss (1979 p. 86) summarise the process of collaborative, ongoing, mutual learning as one in which:

“The overall organizational knowledge base emerges out of the process of exchange, evaluation and integration of knowledge. Like any other organisational process, it is comprised of the interactions of individuals and not their isolated behaviour”

For mutual learning a process of mutual perspective taking is required, where distinctive individual knowledge is exchanged, evaluated, and integrated with that of others in the organization (Tenkasi and Boland 1996). Here knowledge is shared through social interaction with other employees. Much of social behaviour is based on assumptions an actor makes about the knowledge, beliefs, and motives of others (Robbins 1996).

3.2 Organisational Culture

The construct of organisational culture has caused much confusion. While there are multiple definitions, they tend to be vague and overly general. As various disciplines are interested in this topic (anthropology, sociology, psychology) this increases richness, but it does not necessarily increase clarity (Harrison & Shirom, 1998, Schultz, 1994, Hampden-Turner, 1990, Sackmann, 1991, Hofstede, 1991).

Different authors have taken different approaches to arrive at a useful, working definition of organisational culture. Some have attempted to specify the dimensions of culture (Schein, 1990; Hampden-Turner, 1990, Hofstede 1991); others have concentrated on the functions of corporate culture (Williams et al. 1989). There is no shortage of definitions for corporate culture. Geertz, defines it as:

“A historical transmitted pattern of meanings embodied in symbols, a system of inherited conception expressed in and developed by their knowledge about attitudes towards life.... Culture is the fabric of meaning in terms of which human beings interpret their experience and guide actions”

(1973, p.78)

For this thesis a very useful definition is given by Schein:

“*Culture* can now be defined as (a) a pattern of basic assumptions, (b) invented, discovered, or developed by a given group, (c) as it learns to cope with its problems of external adaptation and internal integration, (d) that has worked well enough to be considered valid and, therefore (e) is to be taught to new members as the (f) correct way to perceive, think, and feel in relation to those problems.”

(1990, p.111)

Thus according to Schein, culture involves both underlying assumptions about the world and human nature. Such assumptions can be assumed to influence communication and the sharing of knowledge.

The model developed by Schein (1985) helps to organize the pieces of the culture puzzle. According to Schein's model culture is represented at three levels:

- 1) Observable artefacts and behaviour
- 2) Norms and values
- 3) Basic underlying beliefs and assumptions

These levels are arranged according to their visibility, such that behaviour and artefacts are the easiest to observe, while the underlying assumptions need to be inferred. While behaviour and artefacts may be observable and beliefs and values can be articulated, their meaning may not be readily comprehensible. To understand what the behaviour or beliefs actually mean to the participants/employees, the underlying assumptions have to be brought to the surface or made manifest, which is most difficult as this level of culture is considered to be taken for granted and thus beyond awareness (Furnham & Gunter 1993).

The artefacts and behaviours at the most superficial level are easy to see but hard to decipher. Schein (1985) gives an example of a company with an open door policy, where people wander into each others' offices and argue a lot, Schein then points out that it is difficult to determine what this behaviour means. The open doors are easy to see and to recognise. This artefactual visible and audible environment can provide clues, but rarely does it provide answers for underlying norms and values that lead to this visible behaviour.

The next level of norms and values has more credibility. Here the people are asked why they do what they do. This gives clues for the reasons behind some of their behaviours (Schein 1985). In the previous example of arguing people it may be learned

that people talk to each other because communication is highly valued, and that people argue a lot because they are required to agree on decisions before they act.

The most important layer of the organisation's culture is that of underlying beliefs and assumptions. This is the deepest layer of cultural awareness. Here are taken-for-granted assumptions about how organisational problems should be solved. These basic assumptions tell members how to perceive, think, and feel about things. They are nonconfrontable and nondebatable assumptions about relating to the environment and human nature, human activity, and human relationships.(Cummings and Worley 1997)

According to Schein (1990) these assumptions are usually unconscious, and determine perceptions, thought processes, feelings, and behaviour. Only through intensive questioning can these underlying beliefs be deciphered. It is important to gain such an understanding, because once some of these assumptions are understood it becomes much easier to decipher the meanings implicit in the various behavioural and artefactual phenomena that are observed (Schein 1990).

Although basic beliefs and assumptions are hidden the deepest, they can show up in more visible cultural features, like for example conversations and formal presentations and interviews (Harrison and Shirom 1999). In these cases members of an organisation often state at least some of their beliefs about how things work in and around the organisation. Through the words they use they reveal assumptions about the causes of individual or organisational success, and about influence processes within the organisation. In labels and definitions that members routinely use in referring to events in and around the organisation, assumptions show up. These assumptions concern the "what" of situations, such as "What is a problem?" "What is effectiveness?" "What is a source of status?" For example, when staff in a university hospital use terms such as

“frustrating,” “depressing,” “vegetables,” or “gorks” to refer to elderly stroke patients, their choice of terms points to their assumption that these patients are beyond hope of recovery and should be moved elsewhere for nursing care (Harrison & Shirom 1999 cite Hoffman, 1974). In these cases interviews are used to help the researcher come to know how people deal with challenges and problems and how organisational members handle critical organisational processes, such as strategy formation (Argyris & Schon 1996)

Many people confuse the concept of organisational culture with that of organisational climate. Climate refers to members’ perceptions of organisational features such as decision making, leadership, and norms about work (Denison 1996). Climate studies mainly reveal shared features of the upper, more visible layers of culture and are best studied through the use of surveys. In contrast, the depths and complexities of organizational culture within a single organisation or in a limited number of cases are better explored by inductive and interpretative studies (O’Reilly, Chatman, Caldwell, 1991). These qualitative studies help to decipher the unique cultural characteristics and assumptions of an organisation.

Denison (1996) states that during the early evolution of the culture perspective, the distinction between culture and climate was quite clear. Denison furthermore extends that studying culture required qualitative research methods and an appreciation for the unique aspects of individual social settings. Studying organisational climate, in contrast, required quantitative methods and the assumption that generalisation across social settings not only was warranted but also was the primary objective of the research. Nowadays the overlap between cultural and climate studies is growing (Cooke & Rousseau 1988)

It is necessary to understand the organisational culture as it influences the process of sharing knowledge. A recent study examined the effect of organizational culture on communication and information (Brown and Starkey, 1994). This research indicated that organisational culture has an effect on attitudes towards communicating information. Brown and Starkey (1994 p.808) concluded that: "Information and communication phenomena are surface manifestations of complex configurations of deeply felt beliefs, values and attitudes." This research extends this avenue of research by exploring the "culture of sharing knowledge."

3.3 *Culture of sharing knowledge*

An intensive review of the literature suggested a number of different factors that could, potentially, influence the sharing of knowledge. For the purposes of this thesis, a culture of shared knowledge is operationalized to include the following constructs: openness, trust, availability and use of different communication channels, top management support of the sharing of knowledge and the reward system in place in the organisation. It should be noted that there are many other factors which could potentially be included in a model describing a culture of sharing knowledge. The relationships between the different factors in such a model could also be researched. This exploratory study has, however, selected to focus on only those components that the literature suggests are important (see above).

This section will start with the presentation of the model which gives an overview of the factors being considered. Only those relationships shown in the model were researched in this thesis. Though the author recognises that interrelations between the

variables are likely to exist, such an investigation is beyond the scope of this thesis. After the model has been introduced, the constructs are defined and the reasons for postulating their link to a culture of sharing knowledge articulated.

3.3.1 Proposed Model

Figure 1: Proposed Model

3.3.2 Openness

The first factor shown in the model is openness. Strata (1989) defines openness as the partners' openness in terms of willingness to communicate and willingness for partner interaction. Stata explains openness as the partners' willingness to put all the cards on the table, eliminate hidden agendas, make their motives, feelings, and biases known, and invite other opinions and points of view. According to Lane and Bachmann (1998) openness influences the transfer of knowledge between partners.

Knowledge gained in the field of interorganisational cooperation can be used to justify the inclusion of openness in this model. For example, openness is discussed by Hamel (1991), when he introduces the concept of 'transparency'. Hamel explains that 'transparency' is a determining factor in the potential for learning, and argues that the openness and accessibility of the people working together is due partly to their attitude toward outsiders.

Badaracco (1991 p.16) also links openness with the sharing of knowledge:

"openness is paramount in knowledge links because much of what the parties are trying to learn from each other, or create together, is so difficult to communicate. It is often embedded in a firm's practices and culture, and it can only be learned through working relationships that are not hampered by constraints."

One can expect people working together to limit openness when they have different hidden agendas (Kanter 1983) (e.g. have different backgrounds and work in different departments). In such cases they may only be willing to be open towards specific topics that do not interfere with their departmental interests.

Other authors, working in the area of interorganisational relationships, have referred to the degree of interaction intensity (Aldrich 1979, Johanson and Mattson 1989) a concept that can also be related to openness. Interaction intensity has been defined as the amount of investment an organisation has in its relations with other organisations, in terms both of resources and the strength of the interactions. It has been argued that the more intensive the interactions, the more willing partner firms may be to adapt to each other and share knowledge about each others strategies, needs, and capabilities (Johanson and Mattson 1989). This idea, when transferred to the intraorganisational context, stresses not only the importance of people working closely (at least initially) together to build up a more or less complex relationship, but also the importance of tacit knowledge that is shared in the course of socialisation (i.e. the partners learn more about each other and how to interact.) This suggests that the concept of openness is related to the partner's previous history of interaction; if the prior experience with the other people is positive the openness should be enhanced (Lane & Bachmann 1998, Rotter J. 1980.)

For this thesis, openness will be defined in terms of overall perceived openness of dialogue, and the degree to which the people working together perceive the others of withholding or shielding information and knowledge.

3.3.3 Trust

Trust has a major impact in relationships between people and organisational groups (Nelson and Coopridier 1996). Trust is defined in a number of different ways in the literature. Trust is defined by Zucker (1986 p.63) as "a set of expectations shared by all those in an exchange." Bradach and Eccles (1989) see trust as an expectation that

alleviates the fear that one's exchange partner will act opportunistically. Sitkin and Roth (1993) see trust as a set of expectations that tasks will be reliably accomplished. As Anderson and Weitz (1992) have shown, groups work better together in an atmosphere of mutual trust based on mutual commitment and a stable long-term relationship. For this thesis trust will be defined as the expectation shared by the people working together that they will meet their commitments to each other (Dasgupta 1988).

When people repeatedly work together to obtain mutual goals, they should develop mutual trust (Sherif and Sherif 1953). Mutual trust brings people and groups closer together by sharing expectations and reducing individual fears. Thus trust at the firm level is seen to develop over time as a consequence of individual interaction.

Predictability and dependability are both based on past experience and the reliability of previous behaviour (Dogson 1993). On the basis of past experiences subjective judgements about a partner's future behaviour is made. As feelings of trust become more firmly established and rooted, they depend more on beliefs about the partners' motivations and values and less on direct coding at the behavioural level (Rempel et al. 1985).

As a relationship progresses, Rempel et al. (1985) argue that the focus shifts away from assessments involving specific behaviours to an evaluation of the qualities and characteristics attributed to the partner. Thus, trust is placed in a person, not in that person's specific actions. In other words the question people ask themselves is : "Is the partner a reliable person, someone that is honest and can be relied upon?" (Rempel et al 1985)

Research exists which links the constructs of trust and sharing knowledge. Work by Anderson and Narus (1990) suggests that, the attainment of mutual trust leads to

shared knowledge. They found that repeated group exchange builds trust, leads to increased communications and the eventual sharing of knowledge. Bradach and Eccles (1989), report that by alleviating the fear of the unexpected and facilitating interactions and involvement, trust encourages a culture conducive to the sharing of knowledge. Sherif's (1966) series of controlled studies of camping groups provides empirical evidence demonstrates that repeated episodes of joint effort and communication leads to trust, which *then* leads to the sharing of methods and ideas. These studies suggest that trust – developed through repeated communication – is different from and a determinant of shared knowledge (Sherif 1966, Bradach and Eccles 1989).

In the context of this research, when we look at the issue of trust it is also important to take into account the fear of losing value for the organisation and, therefore, decreasing that proportion of personal job security that is tied to personal expertise. Evidence suggests that some individuals fear that by sharing knowledge, their importance to the company diminishes, thereby increasing their sense that they are exchangeable and more vulnerable to be laid off (Davenport et al. 1998).

When taken together, this body of research supports the idea that trust is a key component of a culture of sharing knowledge.

3.3.4 Availability and Use of Communication Channel

The decision to include the availability and use of different communication media as part of a culture of sharing knowledge is based on research which suggests that the channel of interaction also influences the knowledge transfer and the knowledge sharing (von Krogh 1998). Employees share information, experiences and also knowledge with

each other in various ways, such as email, discussion boards, mail, telephone, computer conferences, and face to face. Previous work in this area would suggest that how closely they interact is an important determining factor in the degree to which they develop a common stock of knowledge. According to Berger and Luckmann (1966) most of our perceptions of others develop in face-to-face situations. There, people can also read the body language and have the richest communication channel. This helps them to develop a better understanding of the other person. Ambiguous messages and tacit knowledge can be communicated thereby increasing shared knowledge (Dixon 1996).

In researching communication channels, March and Simon (1958) observed that the selection of a particular communication channel may be self-reinforcing, leading to its repetitive use whether or not the information provided is, in some sense, optimal. This suggests that decision makers may choose information sources based on criteria other than the quality of the information (O'Reilly 1982). As an example of this O'Reilly (1982) cites research by Menzel and Katz (1955), who demonstrated that physicians often learned of innovations in drugs, not from the most qualified sources such as reputable medical journals, but from more convenient available and accessible sources such as drug salesmen. O'Reilly (1982) came to the conclusion that it is the accessibility, not the quality, of the information source that often is the critical determinant of its use.

In researching what influences managers in choosing their communication medium, Trevino et al. (1987) identified the following three factors: (1) ambiguity of the message content and richness of the communication medium, (2) symbolic cues provided by the medium, and (3) situational determinants such as time and distance.

Trevino et al (1987 p.557) state: "Ambiguity is a key to understanding the amount and kind of interaction that will be required and the communication medium most

appropriate for delivering the message.” As an ambiguous message can be interpreted in many ways, meaning must be created by intensive communication. Alternatively, for unambiguous messages, consensus about meaning already exists.

Ambiguity is expected to influence media selection as follows: When meaning is ambiguous, face-to-face communications will increase. In unambiguous situations, media such as memos, letters, and electronic mail are sufficient to carry the message (Trevino et al. 1987). This derives from Daft and Lengel’s (1984) proposal that media have varying capacities for resolving ambiguity, meeting interpretation needs, and transferring knowledge.

Daft, Lengel and Trevino (1987), report that communication media differ in their ability to facilitate understanding. In that research they characterise communication media as high or low in “richness” based on the media's capacity to facilitate shared meaning. Richness is defined by Daft and Lengel (1984 p. 196) as: “ the potential information-carrying capacity of data.” A rich medium facilitates insight and rapid understanding.

Daft, Lengel and Trevino (1987) place communication media on a hierarchical five-step continuum of media richness as follows: (1) face-to-face, (2) telephone, (3) written personal, (4) written formal, and (5) numeric formal, where face-to-face has the most richness and numeric formal the least. The authors indicate that this five-step continuum was developed using four dimension: (1) feedback, (2) multiple cues, (3) language variety and (4) personal focus. Media which allow instant feedback (i.e. allow questions to be asked and corrections to be made), multiple cues (i.e. physical presence, voice inflection, body gestures, words, numbers, and graphic symbols), a variety of language and a personal focus are considered to be richer. Language variety is defined as the range of meaning that can be conveyed with language symbols. Daft and Wignition

(1979) report that while numbers convey greater precision of meaning than does natural language, natural language can be used to convey understanding of a broader set of concepts and ideas (Daft & Wiginton 1979). Daft et al. (1987) also point out that when personal feelings and emotions infuse the communication, a message will be conveyed more fully. They also note that some messages can be tailored to the frame of reference, needs, and current situation of the receiver. They label this dimension personal focus.

The second variable influencing media selection suggested by Trevino et al (1987) is the symbolic cues provided by the medium itself. As anything can be considered a symbol and a carrier of meaning it is appropriate to ask whether media carry symbolic cues beyond the obvious content of the message. Feldman and March's (1981) analysis of information in organizations suggested that managerial communication behaviour often represents ritualistic responses to the need to appear competent, intelligent, legitimate, and rational. For example more data than needed and professional-looking reports can symbolise the legitimacy and rationality of a decision. Similarly, the face-to-face medium may symbolise concern or caring. The manager who congratulates a subordinate on 25 years of service with an electronic mail message may symbolise a lack of concern, leaving the subordinate feeling furious rather than cared about. Alternatively, a manager wishing to symbolise his or her authority over a matter may use a formal written communication to transmit that message more effectively. Therefore, in organisational communication, the medium of communication is not just a pipeline (i.e. a carrier of messages selected for convenience, availability, or capacity) rather it may be selected for symbolic meaning that transcends the explicit message (Trevino et al 1987).

The third variable that Trevino et al. feel influence media choice is situational determinants. Media choice behaviour is constrained by distance, expediency, structure,

role expectations, or time pressure (Trevino et al 1987). Other research about situational determinant variables identified geographic dispersion and job pressure as influential (Steinfeld & Fulk 1986). As many organisations are geographically dispersed, telephone, teleconference and electronic mail helps employees to collapse distances. As work is conducted under time pressure, communication must fit into the fast paced atmosphere.

In the field of strategic management and interorganisational cooperation, the degree of media richness is seen to be a determinant of the extent to which knowledge is successfully transferred (Daft and Huber, 1987). The research by Daft and Huber (1987) focuses on only the first two underlying dimensions of the four dimensions mentioned above to analyse the richness of the media: the variety of cues the medium can convey and the rapidity of feedback the medium can provide.

Sometimes cues of persons interacting may be misinterpreted. Here, no other form of social relations can reproduce the plenitude of cues of subjectivity present in the face to face situation. Berger and Luckmann (1966) further argue that misinterpretation is less likely in a face-to-face interaction than in less close forms of social relations. Also one party be able to hide its intentions is less likely, in face-to-face communication (D'Aprix 1996).

Daft and Huber (1987) argue, that face-to-face interaction is the richest medium because of its capacity for immediate feedback and the availability of multiple cues. It creates the richest, most open social context through which knowledge is shared. They continued that tacit knowledge can only be shared in face to face interactions. While explicit knowledge can be shared through less information rich communication channels, they argue here that people will be reluctant to share their knowledge unless a relationship (formed through information rich channels) has been established. This research will be

further explore how the different communication channels are associated with the sharing of tacit and explicit knowledge.

3.3.5 Top management support of knowledge sharing

According to Thong et al. (1996) the importance of top management support in IS implementation has been recognised often in the IS literature since the late 1960`s. Ginzberg (1981) found that top management commitment to the IS project and to organisational change can differentiate between successful and unsuccessful IS implementation. Visible top management support encourages positive attitudes on the part of users toward use of the IS and leads to a smoother conversion from the existing work procedures (Davenport 1997).

Davenport et al (1998) found that strong support from senior management is especially necessary for knowledge management projects. They give examples of the types of support that were helpful such as: (1) Sending messages that knowledge management, knowledge sharing, and organizational learning are critical to the company's success, (2) providing funding and other resources or infrastructure for knowledge sharing, and (3) clarifying what types of knowledge are most important to the company. Giving priorities about knowledge to employees gives them direction and helps them to allocate their resources. To support knowledge management top management can also have senior corporate executives (called "chief knowledge officers" by Earl and Scott 1998) that only focus on supporting knowledge management.

Earl and Scott (1998) researched how these "chief knowledge officers" support knowledge management and the sharing of knowledge. They found that such individuals

try to persuade people that knowledge management is not just for the benefit of other people. They also try to motivate employees by showing them that through the sharing of knowledge they can also benefit. Moreover “chief knowledge officers” look for those who are excited about a particular knowledge management idea and are likely to want to try something new. It is believed that these “knowledge champions” (Earl and Scott 1998) will motivate and lead their peers and therefore help the “knowledge officers” to motivate people.

Research by Nadler & Nadler (1996) points out that it is important that top management really support the culture of sharing knowledge with consistent action and do not contradict themselves, as inconsistent behaviour of top management frustrates employees and does not change the culture.

Changing organisational culture is difficult (Bate 1994, Nadler & Tushman 1997, Carnall 1997). According to Davenport et al. (1998) it is most difficult for top management to change the aspects of organisational culture concerning the sharing of knowledge. Top management has to create a positive orientation to knowledge by highly valuing learning on and off the job. Moreover they have to attract and hire people who reinforce the positive orientation (Tushman & O'Reilly 1997)

Top management sets the tone for the culture of sharing knowledge. They state the values and formulate the expectations for the behaviour of organisation members. As von Grogh (1998 p.144) states: “Particular emphasis should be put on the components of an organisational culture that encourage knowledge creation and allow knowledge to flow freely ...” The values explicitly stated by top management need to be visible in everyday managerial actions. Moreover, management might screen the key processes in the

company to find out to what extent the culture supports knowledge sharing and to what extent knowledge is really shared among members of the organisation (Chait 1999).

There is a whole range of supports top management can give to create a culture of sharing knowledge. O'Reilly (1989) identifies the importance of social events. He notes that social events which can range from informal chats around the water cooler to holiday parties are likely to stimulate good relations and face-to-face communication. He does however point out that ceremonies cannot replace content (O'Reilly 1989).

Top management can also introduce project debriefings and other forms of learning-oriented conversations (Davenport et al 1998). These debriefings should help the individuals to get a better overview about what knowledge is located where within the company.

Earl and Scott, for example suggest that top management could allocate some time after closing an innovation project, for debriefing and creating explicit knowledge that can be filed. In the process of creating documents tacit knowledge is converted to explicit knowledge. Created documents can then be distributed and other organisational members can be informed about problems, solutions and lessons learnt from the last project. Such tactics will allow individuals and project members to learn from past experiences before they are on the next project (Earl and Scott, 1998)

Of course top management is also responsible for providing the resources necessary to acquire the technology required to share knowledge. As numerous authors point out, (Garvin 1997, Nelson & Coopridge 1996, Beatty & Gordon 1988, Chait 1999, Davenport 1994), the acquisition of technology alone is not enough. Rockart et al (1996) for example point out that it is more important to create social environments that stimulate and facilitate both arranged and chance conversations. This includes the design

of space, such as designing office and relaxation areas or acquiring and furnishing retreats and learning centres. Moreover communities with common interests who rarely interact with each other have to be brought together.

Like almost every other type of cultural change program, knowledge management projects benefit from senior management support (Nadler & Nadler 1996). Davenport et al. (1998) come to the conclusion that top management support is one of the most important factors for a successful knowledge management project. This thesis links to that research and argues that top management support should be critical for the aspects of culture that concern the sharing of knowledge.

3.3.6 Reward system linked to sharing of knowledge

Often top management does not consistently support knowledge sharing activities and the culture of sharing knowledge and cultural realities are not taken into account when top management announces the culture of sharing knowledge to be important (Chait 1999). One cultural reality is the reward system designed by top management.

The reward system represents a particularly powerful means for influencing an organisation's culture (Esquibel et al. 1990, Kerr and Slocum 1987) and as noted by Pfeffer (1998) influences the sharing of knowledge within an organisation. These links support our decision to include the reward system as a factor of the culture of sharing knowledge.

According to Pfeffer (1998) rewards are more than a payment by an organisation to an individual. They are an exchange. The organisation is looking for certain kinds of behaviour and the individual employee, in exchange for this commitment, expects certain

rewards (Kerr & Slocum 1987). According to Beer (1981) monetary compensation makes up only part, and not always the most significant part, of those rewards. Promotions, fringe benefits, and bonuses as well as the more personal rewards of recognition, self-esteem, and security are all critical parts of the exchange that make up the reward system of any organisation (Cummings & Worley 1997).

According to Kerr and Slocum (1987) reward systems are concerned with two major issues: performance and rewards. Performance includes defining and evaluating performance and providing employees with feedback. Rewards include bonus, salary increases, promotions, stock awards, and perquisites.

As Kohn (1998) notes the reward system – who gets rewarded and why – is an unequivocal statement of the corporation's values and beliefs. The rewards system specifies the contributions expected from members and expresses values and norms to which those in the organisation must conform, as well as the response individuals can expect to receive as a result of their performance. Thereby the reward system according to Esyuiabel et al (1990) controls the behaviours and attitudes of organization members.

It is important to state that, throughout the literature, it is pointed out that monetary rewards have to be used very carefully, as they can easily send out the wrong signals to the employees (Pfeffer 1998, Filipczak 1993, Kohn 1998). Moreover, payment systems will not automatically solve problems concerning the organisational culture (Kerr & Slocum 1987). According to Kohn (1998) 70 studies have found that rewards tend to undermine interest in the task (or behaviour) itself. Moreover, Kohn (1998) states that studies have shown that the more salient or reinforcing the reward is, the more it erodes intrinsic interest. Kohn goes on to note that when intrinsic interests change, the values of

employees also change. This, in turn effects the organisational culture as it will be recalled values and beliefs of employees, are one layer of culture.

Pfeffer (1998) points out that individual incentive schemes can erode teamwork and trust and set people against one another in a competition for rewards. Such erosions would also not promote the sharing of knowledge. Cutcher-Gershenfeld (1998) sum up the current thinking in this field by pointing out that it is not only important to have a reward system that is not counterproductive to co-ordination, teamwork and sharing knowledge, but it is also important to introduce rewards for successfully sharing knowledge.

Often, traditional incentive systems have an adverse effect on the willingness to share knowledge by encouraging individualism and extreme forms of competitiveness (Quinn 1992). Nontaka and Takeuchi (1995) explain that for innovation the creation of new tacit knowledge is important. To create new tacit knowledge, personal relationships with exchanging and sharing knowledge have to be fostered. If the compensation system rewards competition and individual performance, "teamwork and trust will be eroded and people are set against each other in a competition for rewards. Such systems do not promote sharing knowledge. Why should I teach you if we are competing for a fixed pool of salary rises?" (Pfeffer 1998 p.223)

Team-based incentives are a possible solution. The reward received by a team would be based on its overall performance, split equally among all team members. In this case team members would also be encouraged to share their knowledge with the team to increase the overall performance of the whole team (Pfeffer 1998).

Performance appraisals should also emphasise helping and sharing knowledge with colleagues (Kanter 1983). Von Krogh (1998) suggests for example that organisations

should assess each member of the organization on his or her interest in and commitment to building up trust and relationships with colleagues. Furthermore, it is important that this performance appraisal should convey the organisation's behavioural expectations in a transparent way.

Nadler et al. (1992 p.181) emphasise how important it is that reward systems do not hinder the knowledge creating process:

“Organization members usually focus their efforts on doing what is measured, observed, or counted. As a result, they may ignore what is important if learning is to occur. High-level reflection is typically lacking when people are rewarded exclusively for meeting short-term financial targets. Consider the manager who was punished for taking time away from his regular duties to develop an innovative new approach to preventing service failures, which, if carried out, would have saved his company money. ‘I got beat up all year for not making plan-numbers’ he complained. ‘I clearly got the message that I never should do this again’”

Also Garvin (1997 p.5) believes that “changes in the performance, incentive, and measurement systems are essential to create a culture in which knowledge sharing is the norm.” However, measurement remains problematic. It is usually easier to track contribution to knowledge bases or on-line discussions because there the individual's contribution is observable, and names can be attached to specific pieces of material. It is, however, difficult to assess the quality of these contributions.

According to von Krogh (1998), while systems rewarding the contribution to knowledge creation in the company should be emphasised, it should not be expected that incentive systems alone would ensure a culture of sharing knowledge. In fact he points out that a reward for sharing or transferring knowledge could even motivate tactics that were counterproductive to sharing of knowledge (i.e. only the actions that are rewarded are done, but no more) (Kohn 1998).

In summary the literature indicates that reward systems express and reinforce the values and norms that comprise corporate culture, and that it is absolutely necessary to consider the reward system very carefully if one wants to successfully modify the organisation's culture. According to Kerr and Slocum (1987 p.106:) "Reward systems are, in effect, powerful mechanisms that can be used by managers to communicate desired attitudes and behaviours to organisation members." Such links justify our inconclusion of the reward system as a key component of a culture of sharing knowledge.

4 Research Questions

The following research questions are derived from the preceding model. For this thesis the culture of sharing knowledge is hypothesised to consist of the five factors discussed above. It is the goal of this thesis to analyse the relationship between each of these factors and the sharing of tacit and the sharing of explicit knowledge.(i.e. two research questions are examined for each factor.)

Five sets of research questions will be examined in this thesis.

The first pair of questions explores whether openness influences the sharing of tacit and explicit knowledge.

- 1 a) How does openness influence the sharing of tacit knowledge?
- 1 b) How does openness influence the sharing of explicit knowledge?

The second pair of questions explores whether trust influences the sharing of tacit and explicit knowledge.

- 2 a) How does trust influence the sharing of tacit knowledge?
- 2 b) How does trust influence the sharing of explicit knowledge?

The third set of questions explores how the availability and use of different communication channels influences the sharing of tacit and explicit knowledge.

- 3 a) What communication channels are available in the organisation?
- 3 b) What communication channels are used to share tacit knowledge?
- 3 c) What communication channels are used to share explicit knowledge?

- 3 d) How does the availability of these different communication channels influence the sharing of tacit knowledge?
- 3 e) How does the availability of these different communication channels influence the sharing of explicit knowledge?

The fourth pair of questions explores whether top management support influences the sharing of tacit and explicit knowledge.

- 4 a) How does top management support influence the sharing of tacit knowledge?
- 4 b) How does top management support influence the sharing of explicit knowledge?

The last pair of questions explores whether the reward system influences the sharing of tacit and explicit knowledge.

- 5 a) How does the reward system influence the sharing of tacit knowledge?
- 5 b) How does the reward system influence the sharing of explicit knowledge?

5 Methodology:

This chapter will discuss the methods used in this thesis for the field research. This thesis can be considered to be exploratory. As such it was appropriate to use qualitative methodology (Patton 1990). The research design involved an in-depth interview case study of one department in one high technology organisation in Canada's National Capital Region. The justification for using a qualitative approach will be discussed in section one of this chapter. The rationale behind a case study approach is given in section two, while details on interviewing are given in section three. In section four the reasons for using a survey to assess communication patterns will be presented. Section five discusses how the obtained data was analysed. In section six the interview framework will be presented. The interview itself is presented in the seventh and section of this chapter. In the eight and final section the sample will be described.

5.1 Qualitative research

To our knowledge there are no empirical studies with examine the culture of sharing knowledge. As such the area of investigation is new and vague. It was necessary, therefore, to use exploratory research techniques to learn about the dilemmas faced by managers and employees with respect to sharing their knowledge. Such techniques are adequate when the meaning, the definition or the model are yet to be researched (Van Maanen et al. 1982, Cooper and Schindler 1998) and should allow us to get a deeper understanding of the culture of sharing knowledge.

The origin of cultural research lies in qualitative studies, because this technique allows investigators to include specific questions about an organisation's distinct cultural features (Harrison and Shirom 1999) and to make inferences from responses about underlying assumptions and interpretations (Denison 1996; Harrison and Shirom 1999).

Advocates of qualitative methods in the organizational culture area have provided two main justifications for their choice. The first one is based on the presumed inaccessibility, depth, or unconscious quality of culture (Xenikou and Furnham 1996). As Schein (1985, 1990) states the most important level of organizational culture are the 'basic assumptions' (see earlier discussion). Basic assumptions exist at a preconscious level and can be traced through a complex interactive process of joint inquiry between insiders and outsiders. Furthermore, Schein (1990) argues that quantitative assessment conducted through surveys is unwise because it reflects conceptual categories not the respondent's own, presuming unwarranted generalizability. When assessing a new field like the culture of sharing knowledge, therefore, it is important to identify the respondent's own categories. Open ended interview questions are the most appropriate technique in such a case. The second point concerns the possible uniqueness of an organization's culture. This means that an outsider, like a researcher, cannot form a priori questions or measures, especially if a new field is to be explored. This point also supports the use of open ended interview questions.

While it is recognised, that many cultural survey studies exist, their validity has been questioned in the literature (Xenikou and Furnham 1996). Survey methods, are however, appropriate when one wishes to do a systematic comparison between different organisations (Furnham & Gunter 1993).

5.2 Case study research

In this thesis the case research methodology described by Yin (1994) and Benbasat et al (1987) is used. According to Bensbasat et al. (1987 p. 368): “Case research is particularly appropriate for certain types of problems: those in which research and theory are at their early, formative stages...” This is the situation for this thesis, as the effects of the factors of the culture of sharing knowledge and their influence on sharing of tacit and explicit knowledge have not been researched. In attempting to open the “black box” of the culture of sharing knowledge the case research strategy would be the most fitting approach (Szamosi 1998).

The case study also allows the organisational culture to be examined in its natural setting, which enhances the generation of theories from practice. Moreover the case study is appropriate to understand the constructs and their interaction better (Benbasat et al 1987).

The company to be researched was selected by its willingness to participate and its fit with the research objective (i.e. the R & D division of high-technology company). Companies that develop high-technology products are intensively knowledge-based. In these surroundings the culture of sharing knowledge is expected to be highly developed. Furthermore, the R&D department in this high technology company is the place where most new knowledge is created and knowledge sharing is critical. In this department it is expected that the culture of sharing knowledge and its obstacles and enablers are especially obvious. It should also be pointed out that high-technology companies have a lot to gain by better understanding and managing their knowledge transfer processes.

Research in such an organisation should, therefore have high utility in the high technology sector.

5.3 *In-depth interviews*

Semi-structured in-depth interviews are used to gain an understanding of the culture of sharing knowledge – in other words, to get knowledge about the different layers of an organisation's culture as it pertains to the sharing of explicit and implicit knowledge. The main objective is to analyse behavioural norms (how people should behave in concern of sharing knowledge) and organisational values (the things that are highly valued). As Rousseau (1990) states, these layers are characterised by a core theme.

With the help of face-to-face one-on-one interviews a deep understanding of underlying assumptions can be achieved (Schein 1985, 1990). Not only the underlying assumptions, but also the individual meaning and the insider's point of view of the organization can be analysed (Geertz 1973).

In interviews, actual examples of the organisation's typical successes and failures for sharing knowledge can be gathered. These examples can then be more deeply analysed for the underlying assumptions (Krippendorff 1980). By asking the interviewed persons for examples and asking follow up questions, the assumptions and behavioural norms can be extracted, in an joint effort with the interviewed person (Patton 1990).

During the interviews, special focus was given to identify the organisation's symbols, stories, myths that concern the sharing of knowledge. From these one can, with the help of the companies' insiders, draw the correct connections the underlying cultural realities (Schein 1990).

The people interviewed in this study were front-line employees, middle managers, and managers in the R & D division of a high-technology company. The sample frame was selected to include employees who should have a better understanding of the underlying cultural realities as they pertain to the sharing of knowledge (i.e. employees who have been with the company for a longer period of time, are in more senior positions, and are in a department where knowledge sharing is critical, or a new knowledge sharing tool is going to be introduced). End users were interviewed, because this group of people need to be willing to put their knowledge into the knowledge management system and to use it for knowledge transfer if the knowledge management system is to be successful.

5.4 Communication Survey

This thesis was set up to research communication patterns concerning the sharing of knowledge in two steps. The first step was to include a communication survey (included in Appendix I) that was distributed before the interview and collected at the interview. This survey asks quantitative questions relating to communication channels to assess how often people used the different communication media to communicate with others. The questions asked are very straight forward and could easily be asked using a survey.

There are five questions in the communication survey. The first question asked how many hours the interviewee works on an average workday. This data gives background information on which to base further questions and conclusions. The second question asked how much of the working time was spend on communicating with other people. This question was asked to explore how much time is spent on communicating and how important it is. The third question was a table which asked respondents to break down the

total time communicated into different subgroups. The fourth question was also a table designed to collect information on which communication channel was used with the different types of communication (i.e. give us information about the frequency of use of the different communication channels.). This question was included because according to Mintzberg (1973) managers spend a very large proportion of their time communicating, but do not use all channels equally. Whether this can be transferred to the field of knowledge sharing should be researched with these questions. The fifth question asked to list all available communication channels, relating to research question 3a (i.e. What communication channels are available at the studied company).

As planned the communication survey was given out before the interviews took place. Interviewees were asked to bring the completed survey to the interview. Unfortunately - despite the researchers best efforts (i.e. multiple requests through email and telephone-calls) only 12 surveys (response rate of 41%) were returned. Five of these had so many missing values, they could not be used. It was decided that it would be inappropriate to extrapolate the findings from the 7 completed surveys (response rate of 24%) to the survey as a whole. Therefore, the survey data analysis is not presented in this thesis.

5.5 Data analysis

The methods used to analyse the interview data are summarised below.

5.5.1 Interviewing protocols

Before the interviews an introductory sheet with the 2 page questionnaire was emailed to the interviewees (Appendix II). On the introductory sheet the research was explained, the confidentiality was assured and the permission to tape the interview was asked. Interviews were primarily conducted during September 1999. All interviews were done face to face in a separated meeting room (done to ensure respondent confidentiality) at the company's main facility. Interviews lasted approximately 1 1/2 hours. During the interviews the tape recorder was used as the data collection vehicle. All 29 interviewees gave their permission to tape the interview.

Every effort was made during the interviews to eliminate interviewer bias. For example, at no time during the interviews were respondents prompted for specific answers or given any lists to choose from. The interviewer did not comment or give any reaction to any of the answers to avoid biasing the results and to make sure that the views expressed in this analysis come directly from those interviewed. Following each interview, interviewees were briefed on the goals of the research. This was done at the end of the interview (not prior) to avoid biasing the responses.

5.5.2 Analysis of interview data

The majority of the data analysis was qualitative in nature. Each interview was coded and analysed on a question by question and section by section basis. In order to provide a standardised mechanism for analysis a code-book was established. The exploratory nature of the study dictated that much of the analysis be descriptive.

Wherever possible, content analysis was used. According to Cooper and Schindler (1998 p.417): "Content analysis measures the semantic content or the *what* aspect of a message." As this thesis examined aspects of organisational culture it was especially important to examine reoccurring themes, topics and symbols. According to Berg (1998) content analysis is especially useful to (p.225): "... examine ideological mind-sets, themes, topics, symbols, and similar phenomena, while grounding such examinations to the data." This thesis used content analysis to explore those aspects of organisational culture that were postulated in this research to influence the sharing of knowledge.

Since an organisational culture may consist of subcultures (Sackmann 1992), there existed the possibility that different groups of employees would have contrary perspectives on organisational values and, therefore also on organisational culture. The probability of this having an impact on this research was minimised by limiting the research to only one department, where it was expected that the aspects concerning the sharing of knowledge were especially developed. It was expected that within this one department a consistent view of organisational culture existed. This assumption was supported by research by Sackmann (1992) who found homogenous organisational culture within departments and the possibility for cultural subgroupings between departments. In the event of different perspectives concerning the organisational culture, every attempt was made to find as much common ground as possible in order to provide as clear and accurate a description of the factors affecting the culture of sharing knowledge.

Each of the 29 interviews was reviewed and analysed by the researcher using content analysis. For each question, the researcher identified the answers given by the respondent. Each of these responses was given a numeric code. In order to provide a standardised

analysis mechanism, a codebook was established which aided in grouping the responses for each question. This information was then transferred to SPSS-X where the frequencies of responses could be more readily determined.

The literature (Hofstede, 1991; Schein, 1990; Harrison and Shirom, 1998) suggests two variables that may have an impact on the culture of sharing knowledge : (1) years worked for the company: operationalized as 5 years or less of service and more than 5 years of service, and (2) job type: operationalized as manager (director, manager, team-leader) and non-manager (engineer, support staff, others).

According to Schein (1990) organisational culture is perpetuated and reproduced through the socialisation of new members entering the organisation. Schein points out that new organisational members do not yet know the organisational value and belief system, how to act in their organisational roles and thus are trained and 'acculturated' to fit into the organisational culture. This socialisation process takes time (von Maanen, 1978) and as a consequence it is thought that there might be different perceptions of the organisational culture depending on the number of years of service for the company. To consider this socialisation process and to have fairly equal sub-samples the data were split at 5 years or less of service (N = 17 or 59 % of the sample) and more than 5 years of service (N = 12 or 41 % of the sample).

O'Reilly (1989) points out that there is a difference in the guiding beliefs or vision held by top management and the daily beliefs or norms held by those at lower levels in the unit or organisation. Also according to Hofstede (1991) leaders and subordinates might have a different perception of the organisational culture. This literature supported our intent to analyse the data based on a second group of two sub-samples: non-mangers

(engineer, support staff, others; $N = 17$ or 59 % of the sample) and managers (director, manager, team-leader; $N = 12$ or 41 % of the sample).

Data analysis showed that membership in one group (i.e. managers - non-managers) was not strongly associated with membership in the other (5 years or less of tenure - more than 5 years) Job type and years of service were only moderately correlated with a Pearson correlation coefficient of 0.147. This low correlation supported our decision to look at the two between group comparisons.

The following procedure was followed to analyse the interview data. First, for each question the percentage of the total sample who gave a particular response to this particular question was calculated. Second, the sample was divided by years of service into two groups: one with 5 years or less of service ($N = 17$ or 59 % of the sample) and the other with more than five years of service ($N = 12$ or 41 % of the sample) and response frequencies were calculated for each sub-sample. Third, a chi-squared test was used to determine if significant between group differences existed with respect to years of service in frequencies of response. Fourth, the sample was divided by job type into two groups: non-managers ($N = 17$ or 59 % of the sample) and managers ($N = 12$ or 41 % of the sample) and response frequencies were calculated for each sub-sample. Fifth, chi-squared tests were again calculated, in this case to determine if there were significant differences in frequencies of response what could indicate that responses were associated with job-type. Only those between-group differences that are significant are presented in the tables and discussed in the text.

The chi-squared test was used to indicate significant differences in response frequencies. In this thesis an alpha-level of 0.10 was considered to be significant. This alpha level deemed appropriate because of the small sample size ($N = 29$) and the

exploratory nature of this research (i.e. it was not an intent of this research to measure precisely differences in frequencies but to explore this field of research.)

For questions where grades were given the histogram of the total sample is shown in the section with the discussion of results. Histograms were also produced for each of the 4 subgroups. Between group differences in the means was tested with a t-test for significance. An alpha of 0.10 was again used to determine significance.

5.6 Interview framework

According to Yin (1994) it has to be ensured that questions asked in interviews answer the research questions, satisfy the models in the literature review, and involve the correct units of analysis. To meet these objectives all the questions in the interview guide were derived from the literature review (see chapter 3) and based on the model (see Figure 1).

As this research is exploratory, open-ended questions were used to give those interviewed the possibility to come up with their ideas (Berg 1998). Open-ended questions allowed the interviewed persons to describe their understanding of the factors and their relationship to each other (Strauss & Corbin 1990).

It should be noted that in this interview we have followed guidelines set by Strauss (1987) who recommends that researchers have the same types of questions in each section. Cooper & Schindler (1998) found that having the same set of questions helps the interviewed persons to understand the context of questions, and decreases the response error.

For coding and for analysis purposes we have included some questions in the interview that are easily quantifiable (i.e. What mark would you give?) This makes the transition to quantitative research in the coding process easier (Strauss 1987).

The interview guide used repeatedly “why?” questions as a follow up. According to Patton (1990) “why?” questions allow presumed cause-effect relationships to be discovered as they questions presuppose that there are reasons behind the things that occur and that those reasons are knowable.

5.7 The interview

In the beginning of the interview the concept of organisational culture was explained to the employees as the shared values and beliefs about “how things are done around here” or “what really is important around here.” The interview itself was divided into nine sections. The first section set the stage for the interview with general questions to identify sample characteristics. The second section explored the culture of sharing knowledge. The third section researched the sharing of explicit and tacit knowledge. Sections four through eight explored the relationships outlined in the model: section 4 dealt with openness, section 5 with trust, section 6 with the availability and use of the communication channels, section 7 with top management support, and section 8 with the reward system. The interview concluded by asking respondents for suggestions on how to improve the culture so that it is truly supportive for the sharing of knowledge.

To ensure that the definitions and the questions asked were easily understood and relevant to those being interviewed, the interview was pre-tested. Details on the interview are presented below.

5.7.1 General questions

In the first section of the interview the following general questions were asked relating to the background of the interviewed person

1. How long have you worked for Company A?
2. What are your key responsibilities?

Such background information was used to help interpret the findings and to split the data.

5.7.2 Culture of sharing knowledge

At first we asked a general question pertaining to the issue of organisational culture in general to help us understand it within the R& D group at Company A:

3. How would you describe the work culture within the R& D department at Company A?

The next set of questions was designed to help us understand what the employees perceived to be a culture of sharing, determine how close the company is to this ideal (i.e. grade, what they do well) and what kinds of things the company could do to bring their current environment closer to the ideal. The following questions relating to the culture of sharing knowledge were then asked:

4. Describe what the R & D department at Company A would look like if there was a culture in place that truly supported the sharing of knowledge.

In the next step the existing culture within the specific department was examined through the use of the following questions:

- 5. We are interested in how well you think the R & D department at Company A is doing with respect to creating a culture of sharing knowledge. In other words, how close is it to the ideal you described above. I want you to pretend you are a teacher and give the department a grade from 1 to 100 on which represents how close you think the culture within the R& D group at Company A is to the idea culture for sharing knowledge you described above**
→ Why did you give it this grade?
- 6. How does this culture promote the sharing of knowledge? In other words, what does the R&D department do well with respect to sharing knowledge?**
- 7. How does the culture within the department make it harder for you to share knowledge? In other words, what kinds of things does the department need to work on in this regard?**
- 8. What kinds of things could the R&D department do to bring about more of a culture of sharing? In other words, what kinds of things could be done to get rid of the barriers you just identified?**

In the next set of questions we included the following questions on the "not invented here syndrome" - a mindset the contact persons at Company A felt was an important aspects of the culture affecting the sharing of knowledge in the organisation:

9. Have you heard about the “not invented here” syndrome?

- No: The “not invented here” syndrome is the term used to describe resistance to all ideas that have not been created by the group. (Go to 9)
- Yes: What have you heard?

10. How does this syndrome relate to the culture of sharing of knowledge at Company A?

11. What do you think can be done to reduce this syndrome?

The company contact also asked us to include the following questions relating to the respondents' age:

12. Do you think there are barriers of knowledge sharing between younger and more experienced employees?

Why do you think so?

13. What could Company A do to enhance the exchange of knowledge between the different “generations” of employees?

These questions were included so we could see if respondents perceived knowledge sharing was affected by age.

5.7.3 Sharing of explicit and tacit knowledge

In the third section of the interview the sharing of explicit and tacit knowledge was researched further.

5.7.3.1 Sharing of explicit knowledge

In the first sub-section of the third section, interview questions about sharing of explicit knowledge were asked. To begin this part of the interview the interviewer presented the interviewee the following definition of explicit knowledge: “knowledge that is codified. This means documents that contain this knowledge exist. This knowledge is somehow recorded and stored in archives, databases and libraries.” The following questions are then asked:

14. How is explicit knowledge shared within the R& D department at Company A (i.e. face to face, phone, email, memo, databases in intranet)?
15. What does the department do well with respect to the sharing of explicit knowledge?
16. What makes it harder to share explicit knowledge within department?
17. Again, if you had to give your department a grade from 1 to 100 which reflected how good a job it was doing at sharing explicit knowledge, What grade would you give?

→ Why would you give the department this grade?
18. Finally, what kinds of things could the R&D department do to make it easier for people in the department to share explicit knowledge? In other words, what kinds of things could be done to get rid of the barriers you just identified.

5.7.3.2 Sharing of tacit knowledge

The second sub-section focused on tacit knowledge. Again we began with a definition of tacit knowledge as: “the kind of knowledge that is very fuzzy in the heads of the employees and pretty difficult to grasp. It is more a mental model that helps the intuitive understanding how things work or could work.” The following questions were then asked:

19. How is tacit knowledge shared within the R& D department at Company A (i.e. face to face, phone, email, memo, databases in intranet)?
20. What does the department do well with respect to the sharing of implicit knowledge?
21. What makes it harder to share implicit knowledge within department?
22. Again, if you had to give your department a grade from 1 to 100 which reflected how good a job it was doing at sharing implicit knowledge, What grade would you give?

→ Why would you give the department this grade?
23. Finally, what kinds of things could the R&D department do to make it easier for people in the department to share implicit knowledge? In other words, what kinds of things could be done to get rid of the barriers you just identified.

5.7.4 Openness:

The factor openness was researched in section four of the interview. Again we began this section by giving the interviewee a definition of openness. Openness was explained

as: “the employees’ willingness to put all the cards on the table, eliminate hidden agendas, make their motives, feelings, and biases known, and invite other opinions and points of view.” The questions, asked with respect to openness included the following:

24. Describe what the R&D department at Company A would look like if people were truly open with each other with respect to the sharing of knowledge.
25. If you had to give your department a grade from 1 to 100 which reflected how open the department was with respect to the sharing of knowledge, what grade would you give?
 - Why would you give the department this grade?
26. Who do you feel you can share information with openly at Company A?
 - What makes it easy to share information with these people or groups of people?
27. Who do you feel you can’t share information with openly at Company A?
 - What makes it difficult to share information with this people or groups of people?
28. What kinds of information flows freely at Company A? In other words, what sorts of information is shared.
 - Why do you think this information flows freely, is widely shared?
29. What kinds of information does not flow freely at Company A? In other words, what sorts of information is not widely shared.
 - Why do you think this information does not flow freely - is not widely shared?

30. Finally, what kinds of things could the R&D department do to make it easier for people in the department to share knowledge openly

5.7.5 Trust:

This section focused on the construct of trust. The get a better understanding of what trust meant for employees and how it was related to the sharing of knowledge the following questions were asked:

31. How would you define trust?
32. How do you think trust relates to the culture of sharing knowledge at Company A?
33. Describe what the R&D department at Company A would look like if people truly trusted each other
34. Again, I would like you to give the department a grade from 1 to 100 which represents how close you think the R& D group at Company A is to this ideal that you just described.
- why did you give it this grade?
35. Finally, what kinds of things could Company A do to increase trust within the organization?

5.7.6 Availability and use of the communication channel:

In researching the availability and use of the communication channels the following open ended questions were included in the interview:

36. How would Company A look like if there was perfect communication of knowledge?
37. Again, if you had to give your department a grade from 1 to 100 which reflected how good a job Company A is doing at communicating knowledge, what grade would you give?
- Why would you give the department this grade?
38. What does the department do well with respect to communicating knowledge?
39. What makes it harder to communicate knowledge within department?
40. What kinds of things could the R&D department do to make it easier for people in the department to communicate knowledge? In other words, what kinds of things could be done to get rid of the barriers of communication.

5.7.7 Top management support for a culture that encourages sharing of knowledge

This research tried to find out how important top management support was for the creation of a knowledge sharing culture. The following questions were formulated to help us understand how serious top management in the studied organisation has taken the culture of sharing knowledge. The following questions were asked:

41. What would Company A look like if it was the perfect work environment with respect to management support for the sharing of knowledge (i.e. how would managers act, what would they do, what policies would they develop)?

42. Again, I would like you to give the managers at Company A a grade from 1 to 100 which represents how close you think they are to this ideal that you just described.
- why did you give them this grade?
43. What does your own manager do that makes it easier for you to share knowledge?
44. What does your own manager do that makes it more difficult for you to share knowledge?

5.7.8 The reward system

This section of the interview dealt with the reward system, an important factor influencing corporate behaviour. The following questions were asked:

45. What would the reward structure at Company A look like if it was designed to enhance the culture of sharing of knowledge
46. Again, I would like you to give the reward structure at Company A a grade from 1 to 100 which represents how close you think it is to this ideal that you just described.
- why did you give it this grade?

Additional questions about the reward system were then asked to give us more specific information on rewards and a culture of sharing knowledge.

47. How does the current reward system encourage the sharing of knowledge?

- 48. How does the current reward system hinder the sharing of knowledge?
- 49. How could the reward system be changed to enhance the sharing of knowledge?

5.7.9 Suggestions for improvement

In this section we asked questions which were designed to focus the person on what could be done to improve the culture of sharing knowledge. We also asked them to consider their own role in the process. We asked the following:

- 50. How good are you personally at sharing knowledge? Give yourself a grade from one to 100!
→ why did you give yourself this grade?
- 51. What could the organization do to encourage you to share information more widely?
- 52. Finally, you identified a number of barriers to the sharing of knowledge within the R&D group at Company A. What should the organization work on first? What one thing, if it were changed or done, would most improve knowledge sharing?
→ Why do you say this?

5.8 Description of the sample

5.8.1 Where the case study was done

The studied company, (in the following Company A, due to confidentiality reasons), is a designer, manufacturer and marketer of telecommunications products. The following

description of Company A is summarised from its website, and a case study (Koplyay 1997). With its headquarters in Kanata, Ontario, and 74 offices and manufacturing facilities worldwide, Company A employs more than 6300 people and had more than 1300 million CAN \$ revenues in the financial year 1999.

In 1999, Company A looked back at 26 years of technological innovation and leadership in communications. Today Company A is a designer, manufacturer and marketer of semiconductors, sub-systems and systems for communication industries in world markets. It ranks among the worlds top five personal business exchange (PBX) suppliers and top ten networking and telecommunications semiconductor companies in the world. Company A is also a leader in the convergence of voice and computing. In connection with the 25th anniversary celebrations in 1998, the President and CEO, stated, "25 years ago the company was founded with a vision, and Company A has never taken its eye off the ball."

In its 25 years, Company A's product portfolio evolved from world leading telephone systems (PBX) and semiconductor devices to voice communication systems, LAN and WAN networking solutions and computer telephony (CT) products. These products today include integrated circuits for wired and wireless applications, applications-specific integrated circuits (ASIC), optoelectronic devices and custom silicon wafers, voice communication systems, networked voice and data systems, CT integration systems and applications, telephony-enabled servers, public switching systems, alternate network and remote access products.

As in most high-tech companies, the R&D department, with its 500 employees, is the most important department of the entire business. Company A is organised around teams. Each core team is responsible for a productline and consists of team-members of different

departments. Pushed by the senior management to release new products at an increasingly faster rate than the competition, the R&D division of Company A's Business Communications Division puts all its energy into new product development. Several years ago Company A focused on the new world of computer-telephony integration (CTI). Unfortunately, CTI was not required by the marketplace as quickly as Company A expected them to be. This led to higher levels of dealer and customer dissatisfaction, who wanted more support for existing products and higher quality products. To ensure the future success of Company A these problems need to be addressed and solved.

5.8.2 Sample selection

To begin the process Company A was asked to give a list of names of employees within the R+D department who could be contacted with respect to participation in the research. When completing this list it was jointly decided by the researcher and the company contact to over represent management in the sample. This decision was based on 2 factors: (1) it was believed that managers would have a more complete view of the company's culture (i.e. more likely to communicate with upper management in meetings and more likely to interact with front line employees when directing their work), and (2) it was presumed that these managers would have a more in depth perspective of what is going on in their department (i.e. R + D) and would therefore have a better idea of what the factors were which influenced the sharing of knowledge.

Fifty names were on the list, but we were only able to set up interviews with 29 of these people (Response rate of 58%). The final sample was 83% male and 17% female. This gender distribution is representative of the R + D department with 500 employees as

a whole. Forty-one percent of the sample were managers and 59 % non-managers. Another 41% of the sample were employees with 5 years or less of tenure and 59% were longer than 5 years with the company.

The following Table 1 shows the number of employees in the different groups. Eleven respondents (38% of the total sample) were non-managers with less than 5 years of experience. All other groups consisted of 6 respondents (21% of the total sample).

Number of employees (Percentage of sample)	≤ 5 years of experience at the company	> 5 years of experience at the company
Non-Managers	11 (38%)	6 (21%)
Managers	6 (21%)	6 (21%)

Table 1: Distribution within groups

6 Discussion of Results

This chapter will present and discuss the results obtained from the 29 in depth interviews conducted with employees from Company A. This chapter consists of 9 sections corresponding to the groups of questions described in the previous chapter. The chapter will begin with a discussion of the characteristics of the interview sample (i.e. first group of questions). Section two deals with the culture of sharing knowledge, section three with the sharing of explicit and tacit knowledge, section four with indicators of openness, section five with results for the construct trust, section six with the availability and use of communication channels, section seven with top management support, section eight with the influence of the reward system, and section nine with suggestions for improvement.

Each section has a common structure. First the key points of the question to be discussed are repeated. Then a table is shown. Tables are always constructed in the same manner: The first two columns are always the same. In the first column the category of responses is named. The second column summarises the results for the overall sample ($N = 29$). These results are used to rank the categories in descending order. In the table only those categories of responses identified by 10 percent or more of the sample are included. The percentages on the table do not add up to hundred since it was possible (and quite common) for interviewees to give several answers to one question. In other words, multiple responses were allowed for each question. The next pairs of columns only appear if there are significant between group differences in the results. The first pair of columns shows significant differences in frequencies of responses when the sample is divided into two groups on the basis on how long an employee has been working for the

company. The second pair of columns shows significant differences in frequencies of responses when the sample is divided into two groups based on job type: management or a non-management position.

In a case where significant results are obtained for both groups the third column shows frequencies for employees working five years or less for the company ($N = 17$). The fourth column shows frequencies for employees working more than five years for the company ($N = 12$). The fifth and sixth column show frequencies for non-managers and managers. The fifth column shows percentages of given answers of engineers, technical support staff, others such as clerical staff ($N = 17$). In the sixth column frequencies of answers are presented for people holding the title of a team leader, manager or director ($N = 12$).

Following the table the categories of answers are explained in the order shown in the table. Quotes are given to illustrate the responses. The detailed discussion of categories will help to illustrate what respondents meant by their answer and further our understanding of attitudes and values that influence the sharing of knowledge. Significant between group differences in responses associated with years at Company A and job type will then be discussed as relevant (i.e. significant chi-squared). If results with respect to years at Company A or job type do not appear in a particular table, the reader can assume that the between group differences were not significant (i.e. non-significant chi squared)

Finally at the end of each set of questions the author will present a discussion focusing on common themes, observations and interesting insights within the question set.

6.1 General questions / Sample characteristics

6.1.1 Question 1: "How long have you worked for Company A?"

Figure 2: Years at Company A in percentages

The first part of the interview can be used to describe key characteristics of the sample. As can be seen in figure 2, over half (59 %) of the employees in the sample have been at Company A for 5 years or less. Only 14 % of the employees have been with Company A longer than 5 years and less than 13 years. Over a quarter (28 %) have been with Company A for 14 years or longer. The maximum amount of years working for Company A in the sample was 19 years.

The high number of employees with fewer than 5 years service is typical of the high-tech sector that is often characterised as having a high proportion of young employees, a high turnover rate and high mobility (Pfeffer 1998). The fact that over a quarter of the sample have been with the company for more than 14 years is relevant to

this investigation as it is possible that people who have been with the company longer may give quite different answers than those who have been at Company A for a short period of time. There are several reasons why we might expect this group to give different answers including the fact that: (1) they might be more 'indoctrinated' by the company's culture, (2) they may be more likely to remember the financially stringent times where the organisational culture may have been a different, (3) years with the company might be a surrogate for the age of the employee, a factor that those within Company A suspect might affect the willingness of people to share knowledge (see questions 12 and 13).

6.1.2 Question 2: "What are your key responsibilities?"

Figure 3 gives the distribution of job titles for the interviewed sample. Nearly half of the respondents were front line employees with engineering responsibilities. Less than a tenth (7 %) were front line employees working in the technical support area. Taken together nearly half of the sample (41%) had some form of management responsibility: ten (10) percent were team leaders, 25 % held the job title of manager and 7% were directors. This distribution allows us to examine the impact of job type (operationalized here as manager / non-manager) on attitudes and behaviours around the sharing of knowledge.

Figure3: Key responsibilities

6.2 Culture of sharing knowledge

During the interviews we asked 11 questions designed to help us get a better understanding of what a culture of sharing knowledge looks like in its ideal form and how well Company A is doing with respect to this idea. Results associated with these questions are discussed in the section below.

6.2.1 Question 3: "How would you describe the work culture within the R& D department at Company A?"

At the beginning of this set of questions an explanation of organisational culture was provided. Despite this fact, interviewees preferred to compare Company A's

organisational culture with other companies they have worked before. The interviewees often had a hard time understanding why the company was interested in this issue. The following quotes from employees illustrate this:

"It's the technical detail that matters. It is very frustrating if your manager does not understand how things work. They must have superior technical knowledge."

"My manager has introduced employee satisfaction surveys on a more frequent basis. This distracts me from my day-to-day business and it's not important, anyway."

Work culture *	Overall	ψ5 Years	>5 Years
Focus on own responsibility	34%		
Informal, camaraderie	24		
Others	21		
Corporate message	17		
"Pass the buck"	17	6	33
Process oriented	17		

* Multiple responses allowed

Table 2: Work culture (question 3)

Table 2 shows the six responses to this question that were given by more than 10 % of the sample. One third of the sample felt that the culture within the R+D department was one of "individual responsibility" (i.e. "I only look at my piece of the pie.") These respondents felt that the culture focused only on the individual job to be done and not on the overall picture. Respondents described this situation as follows: "Many people around here have the attitude: 'I don't care how my job relates and influences other jobs', or 'I have no ownership feeling of a product or a part of the process, because the big picture gets missed.'"

A quarter of the respondents described the organisational culture at Company A as very open, informal and with a high level of camaraderie: "Company A is very collegial and easy going. Sometimes this 'easy going' attitude is even a little bit too widespread for my taste."

For one in five respondents it was not possible to find a common view of the organisation's culture, as these individual responses described the organisational culture from different sides. These answers were collected with the "other" category and express the following types of sentiment:

"the focus here in this company is on teamwork, but there is too much politics involved throughout the whole company;"

"Company A is very dynamic, that means there is a lot of organisational change. This also leads to resistance to further change and people don't want another change. The company has to define its way into the future and then stick to it."

Nearly one in five of the interviewees described the organisational culture as corresponding to the corporate messages. In other words, this group of respondents felt the culture had formed as a result of the corporate messages of time to market and quality orientation.

Just under 20 % of the respondents described the culture as having a "pass the buck" orientation. To them this meant that nobody with the company wanted to be accountable.

One interviewee explained it as the following:

"emails are c.c.-ed very often to the manager or to the director. I have no idea why people do that, because the manager or director really don't have to know the technical details discussed in the email. I think people want to 'cover their ass'."

In the sixth set of responses, also given by 17 % of the sample, interviewees pointed out the process orientation of the organisational culture. At the high-tech company under

study there is a 'Product Development Process' (internally referred to as PDP) in place that describes the steps that have to be followed from the initial idea of the product to the finished product. In Deal and Kennedy's (1982) taxonomy of corporate culture these are clues for a culture they refer to as 'process culture'. This culture is characterised by the importance of following precisely the process described by the company. Deal and Kennedy conclude that this type of culture is that of a bureaucracy - only very little feedback is provided. The authors go on to add, that in such companies it is difficult to concentrate on outcome, so people concentrate on process. Deal and Kennedy (1982) have found that government, utilities, some banks and insurance companies frequently have this type of culture. As the company under study operates in the high technology area, it is doubtful whether it really has a strong form of the described pure bureaucracy. However, the company is already 25 years old, so it is in a more mature state of its company life-cycle where a focus on process more often is to be seen. Deal and Kennedy point out that a 'process culture' is characterised by excessive reliance on memos by people trying to do what Deal and Kennedy refer to as "cover their ass". This is precisely what the answers included in this category refer to. This would suggest that one in five of those working within the R + D group at Company A had the impression that their company is very bureaucratic and focused too much on the process of how things had to be done despite their being a high technology company.

One response given by less than 10 percent of the interviewees is worthy of note:

- The current culture is one of planning, however, interviewees stated that planning is a problem. The following quote illustrates this:

"Everyone focuses on what and how much work there will be within the next weeks, in other words everyone tries to plan how to allocate resources for the next weeks or months, but the workload for the future changes permanently,

as projects get delayed, new work suddenly appears, because project information is not passed on."

One effect, of this culture, respondents note is that managers have to change their plans constantly as too many necessary completed tasks get delayed or change. An example can be given by a quote: "Do you know that your team also has to deliver that kind of results next week? No ! I should have known that!"

One significant between group difference was found. Employees that worked less than five years at the company were less likely to feel that the "pass the buck" orientation was very strong (6% vs. 33%). This data may suggest that the perception of the organisational culture is influenced somewhat by the amount of years a person already worked at the company. Job type does not appear to play a role in ones view of the current culture.

6.2.2 Question 4: "Describe what the R & D department at Company A would look like if there was a culture in place that truly supported the sharing of knowledge."

There were four responses to question 4 given by more than 10 % of the sample (see Table 3). The most common response, given by almost half of the sample, related to co-ordination and communication between groups. Respondents felt that a culture that supported the sharing of knowledge would emphasise co-ordination and communication between different groups within Company A. Interviewees felt that there should be much

more communication between groups about problems and their solutions. According to the interviewees very often different groups encounter the same problems but are unaware of solutions in a different group. If knowledge about solutions was exchanged more widely it would not be necessary for the different groups to re-invent the wheel. Moreover, respondents felt that in a culture that truly supported the sharing of knowledge, groups are better co-ordinated towards a common goal. This co-ordination would help group members to understand what kind of knowledge the other group needs and where efforts for knowledge sharing should be made.

Culture supports Sharing of Knowledge *	Overall	≤ 5 Years	>5 Years
Communication and co-ordination between groups	45 %		
Experts would not shield	28		
No hierarchy-barrier	24	35	8
Valuation of knowledge sharing	24		

*Multiple responses allowed

Table 3: Perfect sharing of knowledge

The second set of responses, given by nearly a third of the sample, reflects the respondent's belief that a work environment that supports the sharing of knowledge is characterised by experts that are truly open and make their knowledge accessible to others. Some of the interviewees added that experts give answers when there is a personal relationship between the person that asks and the expert, but the experts do not offer their

knowledge without being asked. Some of the interviewees perceived that within R & D the experts shielded their knowledge to make themselves more valuable.

A quarter of the sample indicated that a culture that truly supported the sharing of knowledge would encourage the sharing at all levels. In other words, knowledge would be shared across all levels of hierarchy. Interviewees who gave this answer stressed the co-ordination of knowledge up and down the chain of command: For example, as one respondent noted:

"I really wish the 'upper echelons' would share more knowledge with us. I wish there was more communication between directors and upper management and the decisions and information would be passed down"

The fourth response, also given by a quarter of the sample, dealt with the importance of sharing knowledge as a value within the organisational culture. People who gave this response felt that an organisational culture that truly supported the sharing of knowledge would value the sharing of knowledge more. They gave the following type of examples: "employees who did an exceptional job at sharing knowledge would be rewarded and employees who shared knowledge would get recognition from peers and from top management. In this regard interviewees noted that in a culture that supported knowledge sharing: "Knowledge sharing would be in the corporate objectives." Respondents who gave this response believed that organisational values influence organisation's culture significantly.

Less than 10 % of the interviewees gave the following types of responses:

- "We would have the perfect tools to share knowledge and I would have easy access to any document ever created in Company A." (i.e. the idea culture is one that relies on an technical solution.)

Only one significant between-group difference was observed in these data. Employees that have been with the company for less 5 years were significantly more likely to feel that in a culture that truly supports the sharing of knowledge, employees would shared freely knowledge freely across hierarchical levels (35% to 8%). Again, job type had little impact on the responses given.

6.2.3 Question 5: What grade would you give to represent how close you think the culture within the R& D group at Company A is to the ideal culture for sharing knowledge you described above."

Figure 4: Distribution of grades for supportiveness of the culture to the sharing of knowledge

Figure 4 shows the distribution of the grades respondents gave with respect to the supportiveness of R & D's culture relating to the sharing of knowledge. The average grade given was 65 %. Only 7 % of the employees asked gave their department a failing grade (i.e. less than 50 %); the majority (69 % of the interviewees) gave a grade between 50 % and 79 % (i.e. passing grade but room for improvement). One-quarter of the employees gave their department an A grade (score ≥ 80 %). The grades given would suggest that the majority of respondents feel that the culture with respect to knowledge sharing within the R & D department at Company A has room for improvement.

Analysing the means of the subgroups for significant differences suggests that the view of how supportive the culture at Company A is with respect to the sharing of knowledge is associated with the years at Company A (mean for tenure ≤ 5 years: 69%; mean for tenure > 5 years: 60%; $t = 1.7$; $\alpha = 0.09$). The t-test shows that employees who have worked at Company A for fewer than 5 years were significantly more likely than their counterparts who have worked at Company A longer to view the culture as supportive. There was no significant difference in the means of grades given by non-managers and managers (mean for non-managers: 67%; mean for managers: 63%, $t = 0.77$; $\alpha = 0.45$)

6.2.4 Question 6: "How does the culture in your own department promote the sharing of knowledge? In other words, what does the R&D department do well with respect to sharing knowledge?"

Four responses were given to this question by more than 10 % of the interviewees (see Table 4). Over half of the respondents felt that the fact that they had good relationships with the colleagues in their workgroup promoted the sharing of knowledge. These respondent's indicated that they wanted to share information and knowledge with colleagues that they liked and respected. For this category a very typical answer is:

"The willingness of my colleagues to share knowledge with me is really there, especially if I know them and if I have a professional relationship with them. Company A provides a surrounding where the relationship to my colleagues generally is very good, so they will help me with their knowledge."

Almost one quarter of the sample see the lack of hierarchy within their work group as promoting the sharing of knowledge. As one respondent noted:

"Company A has no hierarchical culture. Company A has an informal culture. This makes it easy for me to share information, because I can directly approach the people that have the knowledge I need."

How the culture promotes sharing*	Overall	≤ 5 Years	> 5 Years	Non Managers	Managers
Relationship with colleagues	52 %				
Lack of hierarchy	24				
Top management promotes sharing	21				
No idea	14	24	0	24	0

*Multiple responses allowed

Table 4: How the culture promotes sharing

One in five respondents felt that the fact that the top management in their sector promoted the sharing of knowledge lead to a culture that encouraged such sharing. People, who gave this response, felt that because top management consistently delivered

the message that communication is important and stressed the importance of knowledge transfer, meant that employees were encouraged to adopt such a culture. Many respondents explained this answer by giving the example of the 'townhall meeting', a quarter-annual meeting of all employees where top management presents the latest financial results and tries to communicate organisational values such as the sharing of knowledge.

Finally it should be noted that 14 % of the sample didn't see anything in the current organisational culture that promotes the sharing of knowledge.

Answers given by less than ten percent of the sample that are worthy of note reflect the following ideas:

- "Cross functional teams are an effective way to bring people and their knowledge from different departments together."
- "Sometimes goals are stated explicitly and a measure is put in place to track it. For example we have the 'Customer Dissatisfaction Index'. This index tracks the most frequent important customer problems. This index is so useful because it helps people to focus on what knowledge is important and needs to be communicated."

There were only 2 significant between group differences in these data with employees with fewer years work experience at Company A and non-managers being more likely than those with more experience at Company A and Managers to say they could not think of any way in which the culture in R&D promoted the sharing of knowledge. In fact, one-quarter of the respondents in both of these groups gave this response versus zero percent of their counterparts in the > 5 years at Company A and

management groups (see Table 4). This indicates that people with more years of service at the company and managers always came up with at least one why in which the organisation's culture supported sharing of knowledge, whereas one quarter of the newer employees and non-managers could not think of anything that helped them to share knowledge. In other words newer employees and non-managers have not been exposed to positive aspects of the organisational culture that support the sharing of knowledge.

6.2.5 Question 7: "How does the culture within the department make it harder for you to share knowledge? In other words, what kinds of things does the department need to work on in this regard."

How the culture hinders sharing *	Overall	Non Managers	Managers
Focus on own group leads to conflict	34 %		
No synergies	31		
Middle Mgm. don't share knowledge	28		
No understanding of how to share knowledge	28		
Corporate objectives hinder	14	0	33
No vision	14		

*Multiple responses allowed

Table 5: How the culture hinders sharing

As shown in Table 5 there were 6 common responses to this question. Just over a third of the respondents perceived that the fact that their group has an internal focus has increased the amount of conflict between their own work group and other groups at Company A. (i.e. every group looks only after their own interests first and this leads to

clashing interests and conflict) Interviewees believed that this conflict was, in turn, hindering the knowledge exchange within Company A.

Another third of the sample gave responses that were grouped under the heading "no synergies." The following quote illustrates the typical line of reasoning for respondents who gave this type of response:

"I described the culture as everyone being only concerned about his/her part of the pie, one group doesn't know what the other is doing. The person in one functional group doesn't know what the peers in his/her own group are doing as you work on different projects. One project doesn't know what the other projects are doing. Everyone only cares about his/her own business but nobody has a clue what others are doing. In the end basically nobody knows what everyone else is doing."

In other words, the fact that there were no synergies between projects acted as a barrier to the sharing of knowledge.

Just over one quarter of respondents felt that the fact that middle managers don't share the knowledge well made it harder for employees within the department to share knowledge. An employee described this situation as follows:

"They just don't filter down decisions. Communication breaks down at the middle manager level. They don't explain why decisions have been made in a certain way."

People that gave this response see the hierarchical structure at Company A as hindering knowledge exchange within their department. Some interviewees attributed this inability of middle managers to share knowledge to the fact that: "middle managers don't share the knowledge well as they perceive knowledge as power." Moreover, employees complain:

"Project cancellation decisions have been made weeks or even months ahead without filtering that information down. This impacts the work-environment

negatively. Employees around here think: Is my product going to be the next to be cancelled?"

One quarter of the respondents felt that the fact that employees within their department "don't understand how to share knowledge" made it harder for them in this regard. The following quote illustrates this attitude:

"We do not really understand how to share knowledge: the tools are difficult, it is difficult to enter knowledge into the tools. Moreover we do not have training of how to share knowledge. We don't have training for better communication."

The last two responses to be discussed were each mentioned by 14 % of the sample. The first of these responses dealt with the perception that the corporate objectives (i.e. time to market and quality) get in the way of sharing knowledge. Employees who gave this response felt that employees only focus on the corporate objectives rather than the process of sharing knowledge. The second of these responses dealt with a perceived lack of focus and vision in their department. Employees that gave this response explained that the lack of vision and focus was a barrier to the sharing of knowledge, as they did not know where the priorities of tasks and values were. As a consequence respondents did not know what kind of knowledge was important and should be shared and what kind of knowledge was not that valuable and efforts should not be wasted on that knowledge.

A response, given by only one individual, is worthy of note as it suggests that fear may be a barrier to the sharing of knowledge. This individual noted that:

"The culture here at Company A is still characterised by the effects of the financial stringent times. So there are leftover suspicions when it comes to some historical changes in product directions. People are still concerned today whether their project might be the next to be cancelled."

There was only one significant between group difference in these data. One third of those in the management group perceived that corporate objectives hindered the sharing of knowledge; none of the non-managers in the sample gave this response. This is an interesting finding in that it is the management group who would be most aware of conflicts at this level. This may also hinder manager's ability to share knowledge downward.

6.2.6 Question 8: "What kinds of things could the R&D department do to bring about more of a culture of sharing? In other words, what kinds of things could be done to get rid of the barriers you just identified?"

How to improve the sharing*	Overall	≤5 Years	>5 Years	Non Managers	Managers
Communicate importance of sharing knowledge	41 %	24	67	30	58
Training	34				
Prove that it works	28				
Standardise on one tool	17				
Social events	14				
Workshops	14			24	0

*Multiple responses allowed

Table 6: How to improve the sharing

There were six responses to this question that were given by more than 10 % of the sample (see Table 6). The most common response, given by just over 40 % of the respondents related to the communication of the importance of knowledge sharing.

Respondents who gave this response felt that the R & D department could bring about a more a culture of sharing knowledge by managers constantly communicating the importance of sharing knowledge. Respondents perceived their co-workers as not seeing the sharing of knowledge as important. The following quote of an employee typifies the attitude of his co-workers that he sees as a barrier to the sharing of knowledge:

"People here are not convinced that knowledge sharing is important. They have the attitude: 'I want to do my work. With no questions asked. Can you really prove that at the end of the day communication and sharing knowledge really makes my work easier?'"

In a related answer, just over one third of respondents felt that training that focused on the need to share knowledge and why communication is important would help the culture. Respondents suggested that this could be done in half-day seminars with small groups. This could also be a chance to bring together groups that are known to have difficulties with respect to knowledge and information exchange.

Just over a quarter of the respondents gave another type of answer that related to the issue of communication. In this case respondents suggested that the best way to build a culture of sharing knowledge was to "prove that it works." To do this, they suggested, R + D needs to share positive examples of how knowledge sharing works. This group of respondents felt that such sharing of small examples and best knowledge sharing practices would illustrate that knowledge sharing is useful. As a side effect, by showing best practices as examples and disseminating them, these practices could be spread throughout the company.

A fourth response (given by 17 % of the sample) is different from those discussed up to now, in that it focuses on a technical rather than human solution to the problem. This group of respondents felt that a standardisation on one single software-tool for the sharing

of explicit knowledge would improve knowledge sharing. This group pointed out that at the present time there are different databases and tools for knowledge sharing spread over the whole department. They felt this lack of standardisation makes it more difficult to share as employees have to handle a whole variety of formats and applications to read information.

The last two responses to be discussed were each mentioned by 14 % of the sample. The first group of respondents suggested that social events would help to improve the work-environment in a way that knowledge was exchanged more willingly. Employees who gave this response thought that social events increase social relationships and decrease the distance between groups, which would, in turn, lead to better sharing of knowledge. Some employees emphasised that they would like to have get-togethers with those workgroups with which they have a high need to share knowledge. Finally 14 % of the sample perceived that a number of workshops and seminars increase the amount of knowledge shared. As one respondent noted: "We need more workshops or seminars where knowledge transferred and experts teach less experienced employees." In other words these respondents felt that workshops dealing with specific technological subjects would enhance knowledge transfer.

Answers given by less than ten percent of the sample that are worthy of note reflect the following ideas:

- **Meyers-Briggs-Personality-Indicator:** employees found it useful for the sharing of knowledge to have some further knowledge about different personalities. Some years ago there has been a department-wide questionnaire. Employees pointed out that this helped them to understand how information is processed by different personalities

(e.g. introverts - extroverts) and that this helped them with communication and the sharing of knowledge.

- **Demo days:** Employees stated that the 'demo days' improve the sharing of knowledge as employees get an overview of the projects with which the company is involved. 'Demo days' are demonstration days where all different groups show what they are working on.

The following quote provides a good overview of the types of suggestions given for the development of a culture within the R + D department where knowledge is shared:

"In key positions and leadership positions there would only be good communicators. Company A would train the key responsible persons especially for communication skills. Employees that don't have good social, communication and leadership skills should not hold management positions. What happened in the past was that people with highly technical skills have been put into leadership positions. Having a leader that is very strong on the technical side leads not necessarily to a successful project, because social skills are the more important key success factor. On the other side people with strong technical skills are extremely valuable to the company, so the company has to find a way to honour their value without having to necessarily put them into a leadership position. Moreover in that position they have to communicate and in many cases they don't like that."

As can be seen from the data in Table 6, there were 3 significant between group differences in these data. Employees with less than 5 years of service were less likely to suggest that the communication of the importance of the sharing of knowledge would bring a positive change in the organisational culture (66 % of those with > 5 years experience gave this response versus 24 % of those with < 5 years experience)

Managers were: (1) more likely than non-managers to feel that the culture could be changed for the better if the department did a better job of communicating the importance

of sharing knowledge (58 % of managers gave this response versus 30 % of non-managers) and (2) less likely than non-managers to feel that workshops where knowledge about specific subjects could be transferred from experienced experts to less experienced employees in that field would be helpful (one quarter of non-managers felt workshops would help versus zero percent of managers).

6.2.7 Question 9a: "Have you heard about the 'not invented here' syndrome (NIHS) ?"

Have you heard of NIHS ?	Overall	Non Managers	Managers
Yes	34 %	18	58
No	66	82	42

Table 7a: Have you heard of NIH?

As can be seen in Table 7a the majority of respondents (66 %) had not heard of the "not invented here" syndrome. This unawareness was especially true at the non-management level where 82% were unfamiliar with this term. The low awareness of the "not invented here" syndrome might indicate that employees are not aware of the problematic consequences described by the syndrome (i.e. resistance to solutions from another group or from outside), or that they were aware of the "syndrome" but did not use this label.

Those individuals who had heard of the NIH syndrome were asked the follow up question

"What have you heard?" "In other words, what does it mean to you?"

What have you heard ? *	Percentage of total sample
Resistance to solutions from outside	17 %
Distrust to other's solution	10 %
Desire to "re-invent the wheel"	10 %

*Multiple responses allowed

Table 7b: What have you heard?

As can be seen from the data in Table 7b, respondents in R + D see the NIH syndrome in 3 quite similar ways: (1) as resistance to solutions from outside of the group or outside of the company, (2) as re-inventing the wheel because they don't trust other group's solution, or (3) as people wanting to "re-invent the wheel", as they like the creative process (i.e. not a lack of trust, but a desire to create is the reason to resist others' solution.) One interviewee gave the following response to this question:

"This means that someone doesn't trust other's solution to a problem. So they rework it (they do the thing again) by themselves to ensure that it is right."

6.2.8 Question 10: "How does this syndrome relate to the culture of sharing knowledge at Company A?"

After the syndrome was explained to those respondents who did not know what it was, this question was asked of all respondents.

How NIH relates ? *	Overall
NIH is part of the culture here	58 %
It's no problem	28
Desire to be creative	17

*Multiple responses allowed

Table 8: How does NIH relate ?

The fact that they could all answer the question once they were told what the N.I.H. syndrome was, suggests that respondents were familiar with the behaviour but not the label. Responses given by more than 10 % of the sample are shown in Table 8. Almost 60 % of the respondents stated that the "not invented here" syndrome is part of the culture at the company. Some quotes here illustrate the mindset prevalent in the company:

"it's unusual to take a solution from somebody else. It its normal to resist other's solution. It's perceived negatively to grab ideas for others."

"I struggle with that on a daily basis. A different group does not take on my work, because they think they should do that. So they resist the work that has been done from myself or our department. They re-invent it and a lot of the knowledge and experience I put in that piece of work gets lost."

One interviewee, in fact, even was very proud to re-invent the wheel:

"Oh I do that very often! Generally I reject a colleague's solution, because I know that I can do it better and his/her solution doesn't work. Only if it is extremely well made I will take a part of it and reuse it. All that 'don't re-invent the wheel' talk is ridiculous. If nobody had re-invented the car wheel the wheels would not have gotten better. So it's important to re-invent the wheel."

Almost 30 % of respondents thought that this syndrome was not a big problem at Company A. These individuals stated that they often used others' solutions after quickly verifying that they worked. It should be noted, however, that the interviewee that provided the last quote also perceived that not invented here is not a problem at the company. This calls into question the validity of this perception.

Almost 20 % of the respondents, while recognising the symptom occurs at Company A, attribute it to the need or desire to be creative rather than a lack of trust. Their attitude can be illustrated with the following quote:

"Engineers here like to create their own solution because they want to be creative – they don't like to use other people's solutions."

Interviewees in a category with less than 10 % made the following interesting observations:

- Innovation is key - As consequence people are geared towards coming up with new ideas, not towards reusing old ones.
- Employees try to get recognised by inventing something new.

It is interesting to note that there were no between group differences in these data. This could suggest that newer employees are not familiar with the term (it has not been shared by employees with greater tenure).

6.2.9 Question 11: "What do you think can be done to reduce this syndrome?"

How to reduce NIH *	Overall	Non Managers	Managers
Change to team focus	34 %	24	50
No solution	28		
Management should intervene	14	0	25
More trust	14		
Corporate objectives hinder	14		

*Multiple responses allowed

Table 9: How to reduce NIH

As can be seen in Table 9 there were five responses to this question. One third of the respondents believe that the way to reduce the NIH syndrome is to change the focus in the R + D department from individuals to teams. These employees felt that within a team environment it is less acceptable to let ones own ego get in the way of the solution and that the focus is to get results from the whole team quickly. These factors, they reason, should hinder individuals from re-inventing the wheel as individuals look for the quickest solution for the whole team. One interviewee stated:

"One solution would be to put more pressure on teams, so that the individuals don't have time to re-invent solutions that are already there. When the focus is on the achievement of the team, people have to come above themselves and must not let their personal ego get in the way."

Almost 30 % of the sample could not think of anything that would reduce the not invented here syndrome at Company A. This very high number suggests that many respondents perceive this attitude to be strongly intertwined in the culture. Some

employees stated: "I don't know how you want to change that. It's not possible to change it."

The last two sets of responses to be discussed were each given by 14 % of the sample. One set of respondents felt that management should try and minimise resistance to other's solutions in their group. Respondents who held this view felt that management should intervene and prevent people from adopting solutions from outside. The second set of respondents felt that to reduce the NIH syndrome the company had to ensure that employees had more confidence in the quality of work done by other employees at Company A. Their hypothesis was that if employees trusted each other, they would be more likely to re-use their work without going through the effort of proving that it works.

Answers given by less than ten percent of the sample that are worthy of note reflect the following ideas:

- Make people aware that a solution is already there. As a consequence the company has to make it easier to find solutions
- People should have to justify why they didn't take the other's solution.
- Management should be made responsible for seeing how knowledge can be shared between the different groups and have them act upon this knowledge, (i.e. management should link the people and solutions in product lines where synergies are obvious).

There were only 2 significant between group differences in these data. Managers were more likely than non-managers to suggest (1) a change to a team focus (one quarter of the non-managers versus half of the managers), and (2) that management should intervene

(zero of the non-managers versus 25% of the managers). The second between group difference could indicate that managers saw the intervention of management as more important than did non-managers.

6.2.10 Question 12a: "Do you think there are barriers of knowledge sharing between younger and more experienced employees (i.e. is there a generation gap)?"

As Table 10 shows nearly two thirds of the interviewees (i.e. a majority of the sample) thought that there were barriers of knowledge sharing between younger and older employees within the R&D department at Company A. Interestingly enough there were no between group differences in these data.

Is there a generation gap ?	Overall
Yes	62 %
No	38

Table 10: Is there a generation gap?

Question 12b: "Why do you think there is a generation gap?"

As this question was a follow up question to the previous question (12a) it was only asked when interviewees thought that there was a generation gap. Two percentages are given in Table 11: (1) the percentages on the basis of the total sample, and (2) the percentages calculated on the basis of only those interviewees that saw a generation gap existing (62

% of the total sample), which are shown in brackets. Respondents gave reasons for a generation gap which could be attributed to the possible thinking of younger and more experienced employees. In other words, the two sub-sections of responses did not represent how younger and more experienced employees actually answered. Rather, they represent a classification based on what the total sample felt were reasons younger and more experienced employees did not share knowledge. This means that one respondent could give reasons how younger employees might reason and thereby contribute to the generation gap (sub-section one in Table 11) , in addition to that this respondent could also give reasons how more experienced employees might reason (response in sub-section two).

Why is there a generation gap? * (only asked when interviewee perceives generation gap)	Overall (relevant sample)	≤ 5 Years	>5 Years	Non Managers	Managers
<i>Responses that attributed the gap to younger employees:</i>					
I don't have to tell him/her	20 (33) %	29 (50) %	8 (13) %		
Fear of perceived as being stupid	22 (14) %	24 (40) %	0 %	24 (36) %	0 %
<i>Responses that attributed the gap to older - more experienced employees:</i>					
Resistance to change	38 (61) %				
Fear of decreasing job security	24 (39) %				

*Multiple responses allowed

Table 11: Why is there a generation gap?

As Table 11 shows four responses were given by respondents in an attempt why they believe there is a generation gap with respect to knowledge sharing at Company A. The most common response in the first sub-section of responses, given by one in five respondents (33% of those who perceived that there was a generation gap), related to the issue of newer employees having hesitations to share knowledge with more experienced employees. From the people who perceived the existence of a barrier of 'different

generations' to the sharing of knowledge one third imagined newer employees not sharing knowledge because they perceived them as thinking "I don't have to tell him/her, they have been around for so many years." In other words, younger employees assumed the more experienced employees already knew what they had to share.

As seen in Table 11, 14 % of the respondents (22.22 % of the sub-sample) felt that newer employees sometimes didn't dare to ask questions, because they didn't want to be perceived as being dumb by asking stupid questions.

The most frequent answer in the second sub-set of responses described the perceived mindset of more experienced employees that may lead to the difficulty of sharing knowledge. Just under 40 % of the sample (61 % of the sub-sample) attributed the generation gap to the fact that more experienced employees are not perceived to be as open to new ways of doing things. An interviewee explained: "they (more experienced employees) like to stick with their way of doing things; they resist change."

Another 24 % (40 % of the sub-sample) attribute the gap to the fact that the more experienced employees are afraid that through the sharing of knowledge their job security is decreasing. This response can be illustrated with the following quote: "I have to watch out, or the newer employee will take over." These responses suggest that employees are more likely to attribute the generation gap to the actions of more experienced employees than to younger employees.

When analysed for between group differences in responses, three significant results are found. Those who have been with the company less than five years were significantly more likely to perceive the gap exists because: (1) less need to tell people things they already know (29 % of total and 50 % of relevant sample believed this, and (2) because younger employees did not want to appear stupid (none of the respondents who had been

with the company for more than 5 years shared this believe). In other words, employees who had been with the company for a short period of time were more likely to give reasons why they, personally, did not share knowledge. Non-managers were more likely than managers (24 % of total sample, 36 % of sub-sample to 0 % to give the "Fear of being stupid response"

6.2.11 Question 13: What could Company A do to enhance the exchange of knowledge between the different "generations" of employees?

This question was asked to all interviewees. As can be seen in Table 12 four suggestions were offered by the sample. The most frequent suggestion for how to improve communication between newer and more experienced employees (given by 38 % of respondents) is that new employees should be given a better introduction to their job. During that introduction their job should be related to the overall Product Development Process. Moreover new hires should be taught about Company A's products and business. Interviewees think that this would help them to understand the situation of more experienced employees better. The following illustrates this view:

"For new workers a mentoring or 'buddy' system should be set up. It has to be avoided to let new hires alone and isolated. They should be connected with someone that can provide the best guidance for the new hire. So he/she has to be a good teacher, not only an expert in an area. He/ She has to have the ability to transfer the knowledge. Moreover it is especially important to bring about an environment, where the new hire dares to ask the 'dumb' or 'trivial' questions without having fear as being perceived as silly. Moreover new employees have to know whom to talk to."

How to reduce the generation gap *	Overall	≤ 5 Years	> 5 Years
Better introduction to job	38 %	24	58
Better team building (social events)	24	35	8
No solution	21		
Bottom up decisions	17	29	0

*Multiple responses allowed

Table 12: Is there a generation gap?

One quarter of the respondents suggested that building teams which consisted of people with different levels of expertise had to be fostered to come over the barrier. Interviewees frequently mentioned social events to help build up social relations in order to over-come work related discrepancies.

One in five respondents thought that it would be very hard overcome the barrier between newer and more experienced employees. People in this category saw no solution for the 'generation gap' problem.

Finally, 17 % of the respondents suggested that the generation gap can be reduced if decisions were made in a more "bottom up" fashion. The following quote explains why these people perceive this to be a solution:

"Often the more senior people have more decision authority through their position, or they claim more decision authority because of their experience. When decisions are made over the heads of younger employees they may be resistant and problems arise."

Other suggestions in categories with less than 10 percent include the following responses:

- Reward more experienced employees to educate and give seminars to newer employees

- Have a quota of documents that have to be produced by the more experienced employees. This way they should be forced to make their tacit knowledge explicit.

While job type was not associated with these data, three of the four responses varied significantly with years of service at Company A suggesting that the type of solution suggested for this problem varies with the age of the employee. Older employees (those with more years of experience at Company A) were more likely to think the "generation gap" could be reduced by giving new recruits a better introduction to the job (60 % gave this response versus 24 % of those with fewer years of experience)

Newer employees (i.e. those with less than 5 years experience) were more likely to think the problem could be reduced by better team building (35 % gave this response versus 8 % of those with more experience) and bottom-up decision making (none of the more experienced workers gave this response versus 29 % of those with fewer than 5 years of experience).

6.2.12 Summary of key findings with respect to a culture of knowledge sharing

To summarise the first group of questions that attempt to identify a culture of sharing knowledge, several reoccurring themes and key characteristics can be found. First of all, the data indicates that employees believe that there does exist an ideal culture that would truly support the sharing of knowledge. This ideal culture of sharing knowledge was characterised by the idea that different groups within one department would communicate more and the co-ordination between these groups would be better.

Aspects of an organisational culture labelled by Davenport et al (1992) as 'Feudalism' seem to point to similar characteristics. The authors perceive as important in a dynamic

business environment that potentially competing and noncooperating parties communicate with and co-ordinate each other. To reach this goal the authors suggest that the organisation explicitly recognise that politics is involved in decision making, and treat politics as a necessary and legitimate activity. According to the authors, groups of employees with different interests have to work out among themselves a collective purpose and means for achieving it. In their research Davenport et al. (1992) found that companies with good communication and co-ordination have top management support to do so and a culture that encourages co-operation and learning on the basis of autonomous decision making.

These research results point out issues that were also important to the employees in this research pertaining to the issue of sharing knowledge. People saw hierarchical decision making as hindering to the sharing of knowledge and, in turn, suggested that the company loosen hierarchical borders and distribute knowledge horizontally and not over the 'chain of command'.

One central issue of a culture of sharing knowledge was that employees saw good relationships with their colleagues as necessary and helpful for the sharing (even more so for newer employees). Most respondents were content with the high level of camaraderie within the R + D department of Company A. In the academic literature von Krogh (1998) points out that when people have good organisational relationships there will be mutual trust, active empathy, and more help among team members. As a consequence, according to van Krogh (1998), employees will then 'bestow' knowledge on others and not shield knowledge as there is a mutual intent to help others to optimise their task performance and to share knowledge. Van Kogh's line of reasoning seems to be consistent with the idea, exposed in this research: "experts would not shield their knowledge." Also van

Krogh states that employees cannot be left alone to solve these tasks, but training programs have to be provided to show employees how to share knowledge and how to encourage and foster knowledge sharing behaviour. The author argues that the focus should be on learning how to help, present personal insights, develop concepts, and justify new ideas. Von Krogh (1998) also suggests mentoring programs to share knowledge between senior and junior employees to help junior members become valuable knowledge creating and sharing members in shorter time. Company A could take these suggestions to heart as at the present time there is no formal mentoring or coaching program set up.

Respondents in this study saw it as important to value the sharing of knowledge by top management and by peers. In the literature Davenport, De Long and Beers (1998 p.52) describe a "knowledge friendly culture" as a culture "that highly values learning on and off the job and one in which experience, expertise, and rapid innovation supersede hierarchy" The authors also mention a close link to the reward system, which will be discussed later in this thesis.

Another key finding is the absence of answers relating to technological solutions to support the sharing of knowledge and to create a knowledge sharing culture. From this section of the interview interviewees saw human aspects and a people centred view as much more important for the sharing of knowledge than technological tools. Interviewees seemed to intuitively understand a key finding from Davenport's (1994) research suggestions that the right technology to share knowledge does not automatically lead to appropriate sharing of knowledge. Respondents, as well as Davenport, stated that even when there is helpful technology in place to share knowledge it is the people that make up the critical success factor for the sharing of knowledge. The author extends that a working

technological knowledge management system cannot transform the information sharing behaviour within a company, as these are rooted in attitudes, values, management expectations and incentives that relate to information. Interviewees seem to understand that changing the technology only reinforces the behaviours that already exist.

The responses of interviewees showed that the 'not invented here' syndrome was a serious problem in their organisation - a problem that appeared to be rooted in the organisational culture. This syndrome is a barrier to the sharing of knowledge at this organisation as it reflects a resistance to use knowledge of other's solutions. According to Harrison (1998) the not invented here syndrome is a cultural orientation that leads to ineffectiveness.

The data would also suggest that within this department there was a barrier of knowledge sharing between different generations. This might be due to the fact that younger and more experienced employees did not speak the same 'language' to communicate knowledge and did not have the same access to knowledge as they did not have the same informal networks (Davenport et al. 1992). Another identified barrier (by newer employees and non-managers) was that younger employees were perceived of having fear of looking stupid. More experienced employees, in turn, were perceived as resistant to change and having concerns with respect to job security. Employees felt that not knowing what others know was another barrier to the sharing of knowledge.

Job type and years of experience had relatively little impact on the results. However, the difference worthy of note is that managers and employees with more than 5 years of experience at the company significantly more often suggested to improve the sharing of knowledge by communicating the importance of knowledge sharing. This might be due to

the fact that these groups of employees see it as their duty to do that and they may have the experience to value this strategic response more.

6.3 *Sharing of explicit and tacit knowledge*

The third group of questions, were designed to gather more information on the sharing of explicit and tacit knowledge. This part of the discussion is divided into two main subsections: part one presents and discusses the results pertaining to explicit knowledge, while part two focuses on the sharing of tacit knowledge.

6.3.1 *Sharing of explicit knowledge*

6.3.1.1 Question 14: "How is explicit knowledge shared within the R& D department at Company A (i.e. face to face, phone, email, memo, databases in intranet)?"

Four responses were given by 10 % or more of the employees (see Table 13). Just over half of the sample answered this question by making reference to a database of the department that contains documents. Some interviewees referred to specifically to their departmental Lotus database. Forty percent of the respondents referred to the Intranet as a source for explicit knowledge sharing and 28 % mentioned face to face communication. Those who mentioned face to face clarified their answer by indicating that they have had to ask others how to get explicit knowledge out of the database or where to find it on the intranet. Other employees stated that it was so hard within their area to find explicit

documents that they preferred to go to the person that owned the file and ask them personally to give out a hardcopy or send a email with the file. Finally, one quarter of the sample shared explicit knowledge by accessing the department's shared drive where documents are stored. When analysing for between group differences this answer was the only one to be given by significantly more managers than non-managers. These data would suggest that most respondents view the sharing of explicit knowledge to be a function of the technology available.

How explicit knowledge is shared *	Overall	Non Managers	Managers
Database	55 %		
Intranet	41		
Face to face	28		
Shared drive	24	12	42

*Multiple responses allowed

Table 13: How explicit knowledge is shared

6.3.1.2 Question 15: "Again, if you had to give your department a grade from 1 to 100 which reflected how good a job it was doing at sharing explicit knowledge, What grade would you give?"

As can be seen from the data in Figure 5 the average grade given by this sample for the sharing of explicit knowledge was 70 %. Only 10 % of the respondents gave the department a failing grade with less than 50 %: Over half of the interviewees gave a grade

of 50 % to 79 %, while just over a third of the respondents gave the department an A-grade with respect to the sharing of explicit knowledge.

As can be seen from the data in Figure 5 the distribution of grades with respect to the sharing of explicit knowledge is skewed to the right. In other words, a higher proportion of the sample gave grades in the 80 % and 90 % range than gave grades in the lower range. These data would suggest that most people in the department were content with the sharing of explicit knowledge. This satisfaction is consistent with their awarding of higher grades.

Figure 5: Distribution of grades for the sharing of explicit knowledge

Analysing the means of the subgroups for significant differences suggests that the view of how good the sharing of explicit knowledge is, is not associated with the years at

Company A (mean for tenure ≤ 5 years: 71%; mean for tenure > 5 years: 69%; $t = 0.24$; $\alpha = 0.82$), nor with job type (mean for non-managers: 73%; mean for managers: 65%; $t = 1.21$; $\alpha = 0.24$) In other words, there were no significant result of the t-test for difference in means.

6.3.1.3 Question 16: "What does the department do well with respect to the sharing of explicit knowledge?"

Best practices in explicit knowledge sharing *	Overall	Non Managers	Managers
All needed documents are made explicit	41 %	53	25
Familiarity with search procedure	38		
Nothing	24		

*Multiple responses allowed

Table 14: Best practices in explicit knowledge sharing

As can be seen from the data in Table 14, Respondents gave 3 different answers to this question. The most common response (given by 41% of the sample) dealt with the Product Development Process (PDP). Respondents who gave this response felt that the PDP forces people to create documents (i.e. explicit information) as they develop products. Most respondents did, however, qualify their answer by noting that this process only helps those employees who know where to find these documents or know to access them.

Just over one third of the respondents felt that their familiarity with the relevant departmental database that contained these documents helped them share explicit knowledge. Many of the employees who gave this answer pointed out that in most cases they knew where on the intranet they had to go to get information they needed. Other employees, who were not as familiar with the company's intranet (often described in the interviews as very complex and hard to navigate) did not find it as easy to share explicit knowledge: The following quote illustrates this situation:

"all the documents I need are on one central location. The searching is O.K. and we had training for that. When you have never done it before it's difficult. When you have done it before, it's easier."

Finally it is important to note that one in four respondents could not think of anything that the department was doing especially well with respect to the sharing of explicit knowledge. They moved on directly to explain the difficulties with the current systems.

There was only one significant between group difference in these data: significantly more non-managers (53%) than managers (25 %) felt that the fact that all needed documents were made explicit during the PDP was an example of what the department did well with respect to the sharing of explicit knowledge. This difference may be due to the fact that it is the technical knowledge needed by non-managers that is made explicit through the PDP. The explicit knowledge managers need to do their jobs may be less likely to be collected by the PDP as it is currently structured.

6.3.1.4 Question 17: "What makes it harder to share explicit knowledge within the department? "

The responses given to this question were in many ways consistent with the clarifications given by many of the respondents in response to the previous question. A cursory examination of the 7 responses given by more than 10 % of the sample, (see Table 15) show that many of the answers are inter-related (i.e. hard to find on intra-net; hard to find in database) and most pertain to difficulties users have interfacing with the technology where the explicit knowledge is stored.

Barriers to knowledge sharing *	Overall	≤ 5 Years	> 5 Years
Hard to find on the intranet	45 %	59	25
Hard to find in databases	38		
Missing explanation for retrieval	24		
Different systems - no standardisation	24		
Information not where supposed to be	24		
Difficult tools	21		
Difficult to access the databases	21		

*Multiple responses allowed

Table 15: Barriers to knowledge sharing

The most common barrier, given by almost every second interviewee (44 %) dealt with the fact that finding information on the intranet is difficult. A related idea, given by over a third of the sample, was that explicit information was hard to find in the departmental databases, as they are not user-friendly and have difficult search functions. These two responses suggest that implementing up to date technology will not, on its own, make it easy for knowledge workers to share explicit knowledge. The interface must

also be easy to use and the knowledge shared in such a manner that it can be easily found and accessed by those who need it.

The next three sets of responses were each given by one quarter of the sample. These respondents pointed out that it is hard for employees to retrieve explicit knowledge, when they have not been explicitly told where to find it (i.e. in what database, on what site of the intranet). They also felt that the different systems and different databases in use in the department were a barrier to the sharing of explicit knowledge. They explained this answer by noting that many of the department's databases needed different applications for knowledge retrieval and had different usernames. This meant that in order to get the explicit knowledge they needed employees had to be familiar with a wide range of different systems, applications, search engines and access procedures. This lack of standardisation made it more difficult to share explicit knowledge. In a similar vein, another quarter of the sample pointed out that explicit knowledge was often not in the database where it was supposed to be: instead it was in a different database or distributed accros several databases. One respondent described this barrier as follows:

"The knowledge is not at the one place where it supposed to be. Instead, it's all over the place, a little here a little there. So I have to search for the pieces of information all over the place."

One in five respondents said that the fact that the different tools used to store information were difficult to use and had a non-friendly user interface made it more difficult to share explicit knowledge. Another one in five respondents described the difficult access to databases as a major barrier to the sharing of knowledge. These employees stated that they often did not have the specific password need for a database and consequently were not allowed to access the database and the knowledge it contained.

Some of the respondents who gave this answer felt that the reason behind this access problem was not necessarily a too restrictive password policy, but rather due to the procedure to set-up accounts which was overly complicated. The following quote describes this situation:

"I am the only one that I know of all my colleagues that ever went to that specific database and really pulled out needed knowledge about past designs that are reusable. It is such a big hassle to get accounts, permissions, software, the right environment for the software for all different kinds of databases that in the end nobody does it."

Responses given by less than 10 % of the sample that are worthy of note include the following:

- Different employees need to access knowledge in different ways:

"There is a lot of variability in how people like to learn, how they like to receive information. That means different kinds of people need information in different kinds of ways. Explicit knowledge relies on one specific kind of people that actively seeks written information. Not all employees are like this. Employees need to be provided with information in a format that most suits them. As this is not done, this is a barrier for the sharing of explicit knowledge."

- Documents get released too late:

"The documents get released too late, because people don't want to be accountable and they don't like to document. So I have to go personally to the persons to get documents I depend on that are not yet released."

When analysed for differences between the groups of employees there was only one significant between group difference in these responses. A significantly higher proportion of employees with less than five years experience at Company A employees (i.e. less than 60 % of that group) found it hard to find knowledge on the intranet as opposed to those who had been at Company A over 5 years (i.e. 60% vs. 25%). This would suggest that

within the newer employees had not received sufficient orientation on the intranet or that those who had been with the company longer had learned how to use the system over time, or both.

6.3.1.5 Question 18: "What kinds of things could the R&D department do to make it easier for people in the department to share explicit knowledge?"

Suggestions for improvement *	Overall	≤ 5 Years	> 5 Years	Non Managers	Managers
Training for knowledge retrieval	59 %	71	42		
Define a knowledge strategy	34			24	50
Mentoring	31				
Standardise databases	28				
Project website	14				

*Multiple responses allowed

Table 16: Suggestions for improvement

The suggestions on how the department would make it easier for employees to share explicit knowledge (see Table 16) are all consistent with the findings discussed in the previous section. The most common response, given by nearly 60 % of the interviewees, suggested that the department provide training sessions on how to retrieve information from the intranet and from databases. Some of these employees added that the R + D department could make a 'Lunch and Learn' session on how to get information from the intranet.

The second most frequent set of responses, given by over a third of the sample, related to the structuring of explicit knowledge. Those who gave this response pointed out that a knowledge strategy (i.e. rules for the R + D department to categorises explicit

knowledge in a standardised way) would help employees to find explicit knowledge easier and faster. Those respondents felt that when knowledge on the intranet is structured homogeneously that people from the different groups could find knowledge in a field that they are not familiar with much easier and faster. They also pointed out that the whole R&D department had to commit to the one knowledge structure for this solution to work.

The third most frequent answer, given by nearly a third of the interviewees, was for the department to pair new employees with experienced workers who knew how to find information. This experienced employee would mentor the new employees and show them how to get specific files.

Just over one quarter of the employees felt that the department could help by standardising software. This group felt that things would improve if the department moved to one database with a standardised access. They felt this standardisation would make it less difficult to browse for and retrieve explicit knowledge.

Finally it should be noted that 14 % of the sample suggested to build up and maintain a project website which contains detailed up-to date information about the problems and the knowledge used to find solutions.

There were two significant between group differences in these data. Significantly more employees that had been with the company less than 5 years than had been with the company longer felt that the company needed to give employees specific training in knowledge retrieval (79 % compared to 42 % with more than 5 years). This data are consistent with the data presented earlier (i.e. newer employees feel it is harder to find things on the intranet). Training may be an answer for this group.

Managers, on the other hand, were more likely than non-managers to suggest that the department define a knowledge strategy. This difference may be due to the fact that the

managers are taking a more strategic (i.e. long-term) view of this problem than are non-managers (i.e. "help me to use it now!")

6.3.2 Sharing of tacit knowledge

6.3.2.1 Question 19: "How is tacit knowledge shared within the R& D department at Company A (i.e. face to face, phone, email, memo, databases in intranet)?"

How is tacit knowledge shared *	Overall	≤ 5 Years	> 5 Years
Face to face	90 %	100	75
Informal personal network	21		

*Multiple responses allowed

Table 17: How tacit knowledge is shared

This question is the first in the subgroup of questions which explore the sharing of tacit knowledge further. As can be seen in Table 17 only two responses were given to this question. Virtually all of the respondents (90%) felt, that tacit knowledge gets shared in face to face interaction. Interviewees added that this interaction may be a one-on-one conversation or a meeting where tacit knowledge is discussed. The other response, given by one in five respondents, pointed to the use of informal personal networks to facilitate tacit knowledge exchange. Respondents who gave this response explained that other employees of their personal network are contacted and asked for tacit knowledge exchange.

While very few individuals felt that the transfer of tacit knowledge is not possible at all, one individual had quite extreme opinions on the matter:

Tacit knowledge is not shared at all. It's not possible. You can't teach it. Either you got it – I'll know that right away, or you don't have it I'll know that too. And I will recognise your ability to understand it with my first sentence. Either you have the ability to understand the complex realities of high-tech products, or you don't. Welcome to the real world.

None of the respondents mentioned seminars held by experienced engineers for the transfer of tacit knowledge.

When analysed for differences of response frequencies, one significant result was found. Every employees with less than 5 years experience at Company A pointed out the sharing of tacit knowledge through a face-to-face interaction compared to three quarters of employees with more than 5 years experience at Company A. This data might suggest that for newer employees the face-to-face interaction is especially important.

6.3.2.2 Question 20: "What does the department do well with respect to the sharing of tacit knowledge?"

Best practices tacit knowledge sharing *	Overall	Non Managers	Managers
Asking co-workers personally	41 %	53	25
Nothing	31	18	50

*Multiple responses allowed

Table 18: Best practices in tacit knowledge sharing

As Table 18 shows, only two sets of responses were given to this question. Just over 40 % of the respondents gave an answer that related to good personal relationships within

the department. These interviewees found it helpful that their good social relationships made it possible to ask co-workers personally for information. They also felt that good relationships also increased the chances that people might share their tacit knowledge.

One third of the employees interviewed felt that the company did not have any particular practice to support the exchange of tacit knowledge. These interviewees mentioned that there were no official practices or programs in place to support the sharing of tacit knowledge.

One answer given by less than 10 % of the respondents is worthy of note:

- Cross functional teams help the tacit knowledge exchange: in cross-functional teams experts with very different kinds of tacit knowledge (i.e. marketing, product line management, and engineering) work together.

There were significant between group differences with respect to the tendency to give both of these responses. Non-managers were more likely than managers to respond that personal relationships help the sharing of tacit knowledge (over half of the non-managers gave this response versus only a quarter of the managers in the sample that gave this response). These data suggest that non-managers are more likely to need personal interaction and good relationships with co-workers for tacit knowledge exchange. This is consistent with the fact that non-managers are less likely to have any form of legitimate power over their co-workers (i.e. need to want to share).

Managers were more likely than non-managers to see no best practices of the department concerning the sharing of tacit knowledge exchange. The fact that managers are more likely to feel the department is not doing anything particularly well with respect to the sharing of tacit knowledge is a disturbing finding as managers: (1) would be more

likely to know if anything pro-active was being done in this regard (2) may have a higher need for tacit knowledge (their job is less structured). This difference could also be due to the fact that non-managers gave examples of informal things being done in the department, where managers thought about structured or formal activities. This would suggest that the company has fewer structured supports for the sharing of tacit knowledge.

6.3.2.3 Question 21: "What makes it harder to share implicit knowledge within department?"

Barriers to tacit knowledge sharing *	Overall	≤ 5 Years	> 5 Years	Non Managers	Managers
Not making it explicit	45 %				
Attitude: "Knowledge is power"	38				
Don't know the relevant expert	31				
Do not know what knowledge exists	24	35	8	35	8
Lose knowledge when key people leave company	17				

*Multiple responses allowed

Table 19: Barriers to tacit knowledge sharing

As can be seen in Table 19 there were 5 responses to this question that were given by more than 10 % of the employees interviewed. Nearly half of the interviewees felt that not making tacit knowledge explicit was the biggest barrier to tacit knowledge sharing. These interviewees added that this barrier was due to the fact that the company did not insist that tacit knowledge be recorded and made explicit in a way that it would be

accessible to others. As a consequence, many employees kept their tacit knowledge in their head.

The second most frequent barrier to the sharing of tacit knowledge, identified by over a third of the respondents, was the perceived attitude of more experienced employees that can be described as: "knowledge is power" and "knowledge is prestige". Interviewees described this attitude as: "My knowledge is my asset and I want to keep it in my head: I am the expert -everyone should come and ask me." A quote of an engineer illustrates the aspect of power in connection with the sharing of tacit knowledge:

"The attitude of the people here is: Knowledge is power! If you give away that knowledge you lose power. On the other hand people want to be perceived by colleagues as being knowledgeable. To reach this they give away knowledge. So most of them are caught up between these two counteracting forces and are very careful with whom they share their valuable experiences."

Nearly a third of the interviewed employees felt that the fact that they did not know who had what kind of skills and tacit knowledge was a barrier to the sharing of tacit knowledge. Interviewees who held this view stated: "I don't know who to go to."

A fourth response, given by one quarter of the sample, can be seen to be a direct consequence of the "knowledge is power" attitude discussed earlier. In this case though, respondents felt that the fact that they do not even know what types of knowledge exist in the company acts as a barrier to sharing and transfer (i.e. how can you ask someone to share something if you do not even know it exists)

Finally it should be noted that 17 % of the sample pointed to the problems that arose when experienced employees left the company. These respondents saw this as a barrier to the sharing of tacit knowledge because experts that leave in most cases had not made their tacit knowledge explicit. As a consequence, their tacit knowledge left with them.

As Table 19 shows, there were two significant between group differences in these responses. Both differences were associated with the fourth response (i.e. don't know that knowledge exists) were interviewees felt that tacit knowledge is not shared. This response was given by over a third of the employees with less than 5 years at the company and by a third of the non-managers as compared to 8 % in the groups with employees with over 5 years of experience and the managers. This is consistent with earlier results and suggests that newer employees in non-management positions are less likely to know who knows what (i.e. don't know when to go for help).

6.3.2.4 Question 22: What grade would you give for the sharing of tacit knowledge?

Figure 6 Distribution of grades for the sharing of tacit knowledge

As shown in Figure 6, respondents gave the department an average grade of 57 % with respect to the sharing of tacit knowledge a much lower score than that given with respect to sharing of explicit knowledge. The distribution of grades given by the interviewees was the following: One quarter of the respondents gave the department a failing grade, nearly half gave a grade between 50 % and 79 %, and the remaining quarter of respondents gave the department an A rating (over 80%). These data suggest that the majority of respondents feel that the department has room to improve with respect to the sharing of tacit knowledge.

The distribution of Figure 6 appears to be bimodal. When testing the means of the distributions with a t-test for difference, no significance could be found. In other words the distinction made in the different subgroups (i.e. mean for tenure ≤ 5 years: 55%; mean for tenure > 5 years: 61%; $t = -0.66$; $\alpha = 0.51$ / mean for non-managers: 59%; mean for managers: 55%; $t = 0.39$; $\alpha = 0.70$) could not explain the bimodal nature of the distribution.

6.3.2.5 Question 23: What kinds of things could the R&D department do to make it easier for people in the department to share tacit knowledge?

Respondents had a number of suggestions on how the department could make it easier to employees to share tacit knowledge (see Table 20). The most common response, given by one out of three interviewees, related to a greater valuation of tacit knowledge exchange. Respondents pointed out that the value of tacit knowledge and tacit knowledge exchange has to be recognised more within the company if the company wants such an exchange to occur. Interviewees gave the following suggestions

"To improve the tacit knowledge exchange it is necessary to educate employees about: What is tacit knowledge, why is it important, why should tacit knowledge be shared, what kind of tacit knowledge should be shared."

Another employee noted:

"It does not happen that a more experienced employee teaches or gives a seminar. They are not interested in giving a presentation. So a lot of tacit knowledge is not transported. If it was one of my objectives to teach a course in a certain subject area and I would get recognised, than it would be my priority and it would have to happen."

Improvements for tacit knowledge exchange *	Overall	Non Managers	Managers
Recognise value of tacit knowledge	34 %	12	67
Transformation to explicit knowledge	28		
Mentoring program	24		
Improve relationships	21		
Make objectives clear	17		

*Multiple responses allowed

Table 20: Improvements for tacit knowledge exchange

Just over one quarter of the respondents suggested that the transformation of tacit knowledge into explicit knowledge has to be emphasised. These respondents justified their response by pointing out that in their opinion it was much easier to distribute and share explicit knowledge. Therefore, less tacit knowledge meant fewer barriers to sharing.

The third response, given by just less than one quarter of the sample, dealt with a mentoring program. These interviewees suggested that a mentoring program should be set up (or at least seminar-series should be initiated) that communicated clearly the answers to the questions: "Who should be asked?" "What is expected from you?" and "What

knowledge should be passed on?" The following quote of an employee illustrates this recommendation:

"A mentoring program should be set up were there is intensive interaction with one another to exchange tacit knowledge as far as it is possible. This could also be done by showing people in which direction to start looking for a specific kind of knowledge and by reviewing their work and then trying to help them, to orient them into the right direction according to the more experienced employee."

One in five respondents felt that it would benefit the tacit knowledge exchange in the R+D department when relationships with other departments were improved. These interviewees pointed out that the informal interpersonal network amongst teams that have to work together should be improved. The following quote of an interviewee illustrates this response:

"When you have a meeting with senior people, everyone tries to push his/her own ideas as much as possible. These engineers are not really listening to each other, they just wait for a time when they can talk. So tacit knowledge is not really shared, as egos only clash during the meetings."

Finally it should be noted, that 17 % of the sample felt that if meetings had a clearer focus and clearer topics, then the sharing of tacit knowledge would be improved. Their argument was as follows: If meetings were clear, then it would be more likely that there would be clearer and more focused understanding of who has to solve what problem (i.e. responsibilities would be clearer), as a consequence, it would be more obvious who needs what kind of information and who should be contacted for a specific kind of tacit knowledge (i.e. the knowledge transfer is then more focused and the goal of the tacit knowledge transfer clearer.)

Another suggestion for improving the tacit knowledge transfer that is worthy of note was to build an intranet site with the name, face, skills, resume and areas of tacit

knowledge of each employee. It was felt that this would help employees to locate people with a specific kind of tacit knowledge.

As Table 20 shows, only the first set of responses relating to the valuation of tacit knowledge differed significantly between groups. Managers were more likely than non-managers (67 % versus 12%) to respond that by a better recognition of the value of tacit knowledge the exchange could be supported. This difference might be due to the fact that managers believed more in the principle that what gets rewarded gets done.

6.3.3 Summary for the sharing of explicit and tacit knowledge

When comparing the grades given for the sharing of explicit and tacit knowledge it can be seen that the grades for explicit knowledge transfer were much higher (mean: 70 %) than the grades for tacit knowledge transfer (mean: 57%). In other words, respondents' satisfaction with knowledge exchange depended on the kind of knowledge involved. Respondents felt that explicit knowledge could and was embedded in procedures and represented in documents and databases and transferred with reasonable accuracy. Tacit knowledge sharing was more problematic.

Employees were satisfied with the explicit knowledge shared, but saw room for improvement concerning the retrieval of explicit knowledge. Responses given for barriers and improvement with respect to explicit knowledge largely related to technology. This might indicate that employees see explicit knowledge as being shared through technology. The main barrier pertaining the sharing of explicit knowledge was that respondents found it hard to locate that knowledge. Social relationships and face-to-face

communication were only used to clarify how to get the explicit knowledge or where it was. As a consequence employees suggested that explicit knowledge sharing could be improved if the company gave training on how to retrieve explicit knowledge and enhanced social relations by implementing a mentoring program. Another suggestion for improvement (mentioned in association with two responses: "define a knowledge strategy" and "extend the intranet") was better documentation of what documents were kept where. The rationale behind many of these suggestions was - if knowledge was easier to locate, and retrieve there would be less need for face-to-face interaction pertaining the exchange of explicit knowledge.

In the literature it has been pointed out that the success of IT-systems for the sharing of mainly explicit knowledge depend on the cultural fit of the system with the organisational culture (Davenport et Prusak 1998). These authors gave an example of a knowledge management system based on a database that should contain explicit knowledge. This system did not work in Japan because the organisational culture did not support the creation and sharing of explicit knowledge. Following this line of reasoning, respondents in this research stressed the importance of making tacit knowledge explicit. Such articulation needs, they stated, to be done in time to be useful and valuable for co-workers further down the work-process. Respondents stressed that the key factor is to motivate people to make knowledge explicit and to be willing to share and to put knowledge into the knowledge management system (i.e. reward them for this type of activity).

The grades given for tacit knowledge sharing were very low (Mean 57 %). Respondents related this not only to the fact that tacit knowledge transfer is difficult and takes time and efforts (Nontaka 1995), but also to the fact that the awareness of a need for

tacit knowledge exchange has not yet arisen in their department. Many respondents felt that tacit knowledge can only be shared through an intensive personal interaction and not through technology. This is consistent with the view of Nontaka (1995) who described this type of exchange as 'Socialisation'. Nontaka (1995) also points out that individuals can acquire tacit knowledge without it having first been made explicit. The author gives the example of intensive knowledge exchanges in the field of craftsmanship where apprentices learn by observation, imitation, and practice. Transferred to the business setting the suggestions given by the respondents to introduce a mentoring program, set up seminars for tacit knowledge exchange and discussions, and to intensify and improve social relationships point in the same direction.

According to many of the respondents a major barrier in the complicated and time intensive process of sharing tacit knowledge could be overcome if more tacit knowledge was made explicit. Nontaka (1995) refers to this as 'Externalisation' and describes it as the process of conversion from tacit knowledge into explicit. He points out that in many cases language is seen as an insufficient mechanism with which to transmit the rich variety of tacit knowledge.

Respondents felt that tacit knowledge would not be shared until the company creates more recognition around the sharing of tacit knowledge. Concerning tacit knowledge respondents pointed out that tacit knowledge transfer requires extensive personal contact. Davenport and Prusak (1998) give examples of processes such as mentoring, a learning partnership, or an apprenticeship to create such a transfer relationship. The authors as well as the respondents described social relationships as essential for the transfer of this kind of knowledge. Interviewees felt that the more

information rich, and tacit, knowledge is the more technology should be used only as a mediator (i.e. to help people find each other for face-to-face knowledge exchange.)

The more experienced employees in this department seem to have advantages in accessing knowledge. Concerning explicit knowledge, they know where this knowledge is to be found and how it is to be accessed. Newer employees were struggling to find this out. Moreover, more experienced employees seem to leverage their social network that has grown over the years to help them exchange tacit knowledge. It appears from the questions about the generation gap (i.e. last section) that the culture in place at Company A did not encourage transfer of tacit knowledge between newer and more experienced employees.

To improve the exchange of tacit and explicit knowledge the suggestions can be split into two groups: (1) immediate help, and (2) long term projects. To immediately improve the situation the respondents suggested: (1) Training to find explicit knowledge on the intranet. This could be done by 'lunch and learn' sessions or by interactive training units. (2) A better structure of the explicit knowledge already available (one single consistent knowledge structure for the whole department has to be introduced). (3) Setting up a mentoring program. This would foster the exchange of tacit and explicit knowledge. Tacit knowledge would be transferred mainly from the more experienced employee to the newer employee by face-to-face communication. The more experienced employee also could help the newer employee learn how to retrieve explicit knowledge from the intranet thereby supporting the explicit knowledge transfer.

Suggestions to help on how to share tacit and explicit knowledge that are of a more strategic nature included the following: (1) Migrate to one system. This would ease the explicit knowledge exchange, because it would make sure that all employees are familiar

with the applications to access the databases, and to share files. The problem with this solution, according to the respondents, was that many people may be upset that they are no longer allowed to use their favourite application. (2) Value the sharing of knowledge. The sharing of knowledge has to be recognised and resources should be there to support programs that enhance the sharing of tacit and explicit knowledge. Valuing the sharing of knowledge, in turn, means that this behaviour should be reinforced by an adequate reward structure that rewards this behaviour.

Interestingly enough the strategic responses were significantly more often given by managers than by non-managers. This might indicate that non-managers are more focused on the operating business and managers have more of a long term orientation towards this issue.

6.4 Indicators of openness:

The fourth group of questions were designed to explore the construct of openness further. To introduce this topic, the interviewer defined openness. Twelve questions dealing with "openness" were then explored.

6.4.1 Question 24: Describe what the R&D department at Company A would look like if people were truly open with each other with respect to the sharing of knowledge.

Respondents identified 4 characters of an open work environment (see Table 21). The most popular view, by far, of an open environment (given by 55% of respondents) was one where employees would not have hidden agendas. Interviewees pointed out that in an open environment decisions would be explained openly and management would stick to those decisions. The following quote given by an interviewee illustrates this response:

"Concerning the upper management I very often wonder why decision are made in a certain way. Nobody explains openly why decisions are made in a certain way. Many employees feel that there is *way too much* politics involved in decision making. This makes it hard to have trust in and respect for these 'leaders' of the company as they are not open with their decisions. Moreover, decisions get made and changed so often and so quickly that you wonder why these decisions get made in the first place. So it's very hard to believe that they are open in what they are saying, when you know that a week down the road they may change the decision again. It's not possible to get focused on something, when you don't have trust in the vision and direction that top management is giving out.

Ideal world of openness *	Percentage
No hidden agendas	55
Not taking criticism personally	21
Experts would not shield their knowledge	11
Less hierarchies	11

*Multiple responses allowed

Table 21: Ideal world of openness

One in five respondents felt that in an open environment no one would take criticism personally, and everybody would feel comfortable in voicing his/her concern. This attitude would foster openness as nobody would be upset when criticism and problems were voiced.

The third and fourth set of responses were given by only 11% of the sample. Respondents pointed out that in an open environment experts would: (1) not shield their knowledge but make it publicly available, and (2) feel able to voice their concerns directly to the relevant co-worker without having to go through the chain of command.

Other interesting comments included the following:

- Not hiding but openly admitting mistakes: Respondents felt that in an open environment everyone (individuals, teams) would openly admit mistakes. They would do this because they would recognise that by doing so they would help the whole company as well as themselves.

One employee made the following comment about what openness means:

"We have to move to a *transparent* organisation. This means all kinds of information and knowledge is shared across the whole organisation. Everyone can find out what everyone else is doing. So every engineer also could access marketing and sales information. Any kind of information that has influenced the decisions that affect me and my project have to be made available to everyone. In a truly transparent organisation even resumes and salaries are accessible."

There were no significant between-group differences in these data.

6.4.2 Question 25: What grade would you give for openness on a scale from 1 to 100?

The distribution of grades given by respondents for openness are shown in Figure 7. The mean grade given by those respondents who felt comfortable answering this question was 61 %. Fourteen respondents declined to give the

company a grade for openness. It may be that these individuals did not think that the R & D department was an open place.

Figure 7: Distribution of grades for openness

A further analysis of the data shows that one in five of the employees that gave a grade, rated the openness under 50 %. Almost 70 % of the respondents gave a grade between 50 % and 79%. The remaining 10 % of the sample gave an A-grade. While the data suggest openness is low, this might be the norm in the high technology sector. One respondent put the situation into perspective:

"In a professional environment there will never be a really high grade of openness. There will always be hidden agendas. But as far as openness is possible, its done here."

The t-tests were not significant. The grade given for openness is not associated with years of service (mean for tenure ≤ 5 years: 52%; mean for tenure > 5 years: 52%; $t = -0.02$; $\alpha = 0.99$) or job type (mean for non-managers: 54%; mean for managers: 50%; $t = 0.42$; $\alpha = 0.68$.)

6.4.3 Question 25b: Why would you give the department this grade?

Explanation of grade *	Overall	Non Managers	Managers
<i>Negative aspects</i>			
Experts shield knowledge	41 %	24	67
Too much politics	38		
Communication problem	38		
<i>Positive aspects</i>			
In personal discussion most people are open	31		

*Multiple responses allowed

Table 22: Explanation of grade

This follow-up question was asked and answered by all interviewees, even those that did not want to give a grade. As shown in Table 22 more of the responses explained or justified negative grades than positive grades. Just over 40 % of the respondents justified their grade by noting that experts shield their knowledge. These respondents did not perceive experts as being open. Some interviewees suspected that these experts thought that protecting their knowledge would help them to look good, and would increase their exposure. Respondents gave the following examples of how experts shielded their

knowledge: experts waited to be asked, kept back their knowledge and did not offer help where they saw it would be useful.

Nearly 40 % of the responses pertained to the issue of politics in decision making. Respondents justified their grade by saying there was too much politics involved in decision making. They perceived decisions were not made based on rational decision criteria, but based on hidden political agendas.

Just under 40 % of the interviewees stated that they gave the grade they did because they had observed communication problems or communication breakdowns between groups which negatively influenced the degree of openness between these groups. Interviewees illustrated this response by giving examples of meetings of different groups that needed to work together. In these meetings different personalities clashed. This in turn, had lead to a communication breakdown between these groups.

There was only one set of responses given to justify the view that the environment was open. Nearly a third of the respondents felt that their colleagues were open when they were approached and asked personally for information or help.

One response, given by less than 10 % of the sample is worthy of note:

- In high-tech nobody is afraid of loosing their job: these respondents felt that employees were very open, because in the high-tech R&D environment most people were not afraid of loosing their job and as a consequence were not shielding knowledge to increase their job security.

There was only one significant between group difference in these data: significantly more managers (67%) than non-managers (24%) felt that experts shielded knowledge. The managers may have been in more of a position than non-

managers to be aware of or have observed such behaviour (i.e. managers more likely to be aware of who knows what, non-managers have already stated that they often are not aware of who knows what)

6.4.4 Question 26: Who do you feel you can share information with openly at Company A?

As can be seen in Table 23a, three responses were given by more than 10 % of the sample. The most common response, given by nearly 70 % of the sample, related to the open relationship to co-workers. These respondents felt that they could share information with at least some of their co-workers openly. Most of the interviewees added that while they were not open with all of their co-workers, they were open with most of them (especially the ones in their immediate group.) One in five respondents felt that they had a open relationship with their manager and felt that they could openly share any information, knowledge and problems with that person. Seventeen percent of the respondents stated that they could be open with most people in the R&D department. There were no between group differences in these data.

With whom you can be open *	Percentage
Couple of my co-workers	69
Manager	21
Most people in R&D	17

*Multiple responses allowed

Table 23a: With whom you can be open

6.4.5 Question 26b: What makes it easy to share information with these people or groups of people?

Five responses were given to this follow-up question (see Table 23b). The most frequent response given, by almost half of the interviewees, pertained to good social relations: people shared with those they had a good social relationship with.

Why you feel you can be open *	Overall
Good social relation	45
Trust co-workers	21
Own openness	21
Managers are easily approachable	17
Trust manager	17

*Multiple responses allowed

Table 23b Why you feel you can be open

The next two responses to be discussed were mentioned by one in five respondents. In the second response respondents indicated that they trusted their co-workers which in turn enhanced their openness. In the third set of answers, respondents described themselves as having a very open personality, and not shielding any knowledge.

The last two sets of responses were both given by 17 % of the interviewees. In the forth response interviewees felt that managers were easily approachable. These respondents added that this fact encouraged them to share knowledge with their managers openly. In the last set of responses employees pointed out that they had trust in their manager and that this helped them to be open with their manager. There were no significant between-group differences in these data.

6.4.6 Question 27a: Who do you feel you can't share information with openly at Company A?

There was a high degree of consensus within this sample regarding who respondents did not feel they could be open with (see Table 24a). Nearly 60 % of the respondents gave an answer that mentioned people in other groups (i.e. an individual or a group of people in another department with whom they felt they could not share knowledge openly.)

Who can you not be open with *	Overall	Non Managers	Managers
People in other groups	59 %		
Some of their team-mates	24	35	8
Some experts	17		
Manager	14		

*Multiple responses allowed

Table 24a: With whom you cannot be open

One quarter of the employees felt that they could not be open with some of their team-mates - they preferred to have some professional distance. The third set of responses, given by 17% of the sample, related to experts. Respondent felt they could not be open with these experts, because the experts were not open with them and shielded their knowledge. Fourteen percent of the interviewees felt that they could not be open with their manager.

There was only one significant between group difference in these data: significantly more non-managers (35 %) than managers (8%) felt that they could not be open with some of their team-mates. This difference may be due to the fact that non-managers work more often in a team setting than managers

6.4.7 Question 27b: What makes it difficult to share information with this people or groups of people?

Why are people less likely to be open with colleagues in other sections and with some of their own colleagues? As can be seen in Table 24b, the most frequent response to this question (given by almost half of the interviewed employees) pertains to the issue of negative conflict. These respondents felt that they have had some kind of negative conflict with another group or another individual. Many attributed this negative conflict to the fact that every group wanted to get the glory and the recognition. These respondents added that this conflict is the barrier to an open communication.

Why you cannot be open *	Overall	≤ 5 Years	> 5 Years	Non Managers	Managers
Negative conflict	48 %			35	67
Dishonesty	34	18	58		
Experts want to enhance their position	34				

*Multiple responses allowed

Table 24b: Why you cannot be open

One third of respondents felt that other groups are not honest with them. These respondents pointed to the fact that these other groups did not explain their decisions and did not appear to be openly sharing knowledge and valuable project-information (i.e. had a hidden agenda). This, in turn, made it difficult for them to share knowledge with these groups. Another third of the interviewees felt that experts wanted to enhance their position by being not open. These respondents felt that this behaviour made it difficult to share knowledge with these individuals openly. The respondents who gave this responses attributed the experts shielding behaviour to the fact that the experts wanted to be recognised as *the expert* in a certain area. To be "the expert" they had to shield their knowledge and be "unopen".

There were two significant between group differences in these data. Significantly more employees that have been with the company more than 5 years (58%) than newer employees (18%) thought that dishonesty of another group was the reason for a barrier to openness. It may be that their longer organisation tenure has given them more opportunity to observe this type of negative behaviour in others.

Managers, on the other hand, were more likely than non-managers to suggest that negative conflict is the reason that they could not be open with colleagues.

6.4.8 Question 28a: What kinds of information flows freely at Company A?

Respondents could identify only 2 types of information that they felt was free flowing (see Table 25a). There was consensus with respect to only one of these 2 types of information. Three out of four interviewees pointed out that technical information was

free-flowing within R&D. The second set of responses, given by 17 % of the sample, pertained to basic project information (i.e. what the project is about and who is on the project) It is worthy of note that 10 % of the interviewees thought that no kind of information was really free-flowing, within R + D.

What information is free-flowing *	Overall	≤ 5 Years	> 5 Years
Technical information	76 %	65	92
Basic project information	17		

*Multiple responses allowed

Table 25a: What information is free-flowing

There was one significant between group difference in these data. Significantly fewer employees that have been with the company less than 5 years than have been with the company longer felt that technical information is free-flowing. (65 % compared to 92 % with more than 5 years). This might be due to the fact that more experienced employees know where to look for technical information in the databases or the intranet and that these employees have a large informal network.

6.4.9 Question 28b: Why do you think this information flows freely, is widely shared?

There was very little consensus with respect to why the information noted previously is widely shared (see Table 25b). One possible reason for this is that the reasons behind sharing information might be very complex. Nearly 40 % of the sample said that

information that was widely shared was very important. These respondents felt that the information that was widely shared (i.e. mostly technical information) was information that was absolutely essential for the every day work to be done (i.e. had to be shared to avoid a breakdown in the workflow).

Why do you think it is free-flowing *	Overall
Information is essential	38%
Information is least valuable	17

*Multiple responses allowed

Table 25b: Why do you think it is free-flowing?

Seventeen percent of the respondents thought that the kind of information that was shared was material that was perceived to be the least valuable (i.e. this information was shared because it was not perceived to be linked to advancement, prestige or power). There were no significant between-group differences found in these data.

6.4.10 Question 29: What kinds of information does not flow freely at Company A?

What information is not free-flowing *	Overall	≤ 5 Years	> 5 Years
Important planning information	48%		
Real agenda	41	29	58
Organisational knowledge	34		

*Multiple responses allowed

Table 26a: What information is not free flowing

As can be seen in Table 26a, three responses were given by more than 10 % of the sample. The most common response, given by almost half of the sample, was important planning information. Respondents who gave this answer felt that important information about planning was not flowing freely, as they perceived managers not informing them about important changes in the direction of the project. Respondents gave examples where team-members were lacking information about accountability for different parts of a project.

The second set of responses dealt with the hidden agendas. People who gave this response felt that people were not sharing their real agendas (i.e. why a decision was made in a certain way). This is an interesting finding in that many respondents defined an open work environment as one with no hidden agendas.

The last set of responses was mentioned by one in three interviewees. These people pointed out that organisational knowledge (i.e. insider information about the organisation) was not flowing freely. Respondents felt that they had no knowledge about who is doing what and with what reasons. Moreover they felt that they don't know where the company was heading and what projects were going on in other parts of R&D.

As Table 26a shows only the one between group difference was found pertaining to the real agendas of decision makers. Significantly more experienced employees than newer employees (58 % versus 29%) felt that real agendas are not free flowing. One possible reason might be that the more experienced employees have a better understanding of the situation in the company, what the rational decision would be and as a consequence they are more sensitive to decisions that are made with politics involved.

6.4.11 Question 29b: Why do you think this information does not flow freely - is not widely shared?

Table 26b shows the three responses, given by more than 10 % of the sample, to justify their reasons for identifying the barriers that they did in question 29a. Over 40 % of the respondents mentioned that they did not share information with some people because they did not trust them or their real agendas. The following quote of an interviewee illustrates this response:

"Only that kind of knowledge is shared that you really want the other person to know. In most cases you say: Why do they have to know this? Send them over here so that I can talk to them personally, but I think this attitude is common in every work environment."

Why is this information not free-flowing *	Overall
Distrust	41%
Political decision making	34
Information stops at middle management.	31

*Multiple responses allowed

Table 26b: What information is not free flowing

One third of the respondents perceived that politics was the main reason that a specific kind of information was not flowing freely. Employees who gave that answer clarified their response by pointing out that they were not willing to share information or knowledge with people that they thought were trying to influence projects in a way that would benefit them.

Just less than a third of the interviewees perceived that information stopped somewhere at the middle management level. These respondents felt that information is not flowing down the chain of command. In other words, the middle management level was perceived by this group of employees, as filtering information and limiting its ability to flow down the organisation. There were no significant between-group differences in these data.

6.4.12 Question 30: What kinds of things could the R&D department do to make it easier for people in the department to share knowledge openly?

Improvement of openness *	Overall	≤ 5 Years	> 5 Years	Non Managers	Managers
Communicate value of openness	59 %	82	25		
Conflict resolution training	24	0	58		
Company objective for openness	24	6	50	12	42
Enhance relationships	21				

*Multiple responses allowed

Table 27:Improvement of openness

Table 27 shows the suggestions given by more than 10 % of the sample on how R + D could improve the openness in the organisation. Nearly 60% of the interviewees suggested that the fact that the company valued openness and the sharing of knowledge has to be made clear (i.e. explicit) and communicated more intensively to employees. These respondents added that positive examples and best practices should be communicated throughout the company. These respondents also felt that managers should

constantly emphasise the importance of open communication and open knowledge transfer and be role models by communicating more information downwards. The following quote by an employee illustrates the situation:

"Right now, employees see no value in open communication and sharing knowledge openly. They see it as a loss of power. They think that knowledge shielding gets them ahead. This has to be improved by making them the value of exchanging knowledge clear with positive examples."

One in four interviewees thought that conflict resolution training (and communication training in general) would improve the openness within the company. Interviewees thought individuals and groups that have had negative conflicts in the past and are not open with each other should participate in these training sessions first. Respondents suggested that the focus of that particular training should be to overcome barriers to open knowledge exchange. One interviewee expanded on that idea:

"This conflict training would also improve the people's ability to listen. Here lays the problem. People are fairly open but they are not receptive. They don't listen to other's opinion."

Also one quarter of the sample thought there has to be a company directive in place that states: "It is important to share knowledge" or "It's against the culture to hoard knowledge." These people felt that if sharing was a company objective, then middle managers would have to justify their knowledge sharing efforts and how they built up a more open environment.

One in five respondents thought that the company needed more social events where people could built up relationships with their peers in an non-threatening environment if openness was to be increased. This suggestion is consistent with earlier suggestions with respect to the improvement of knowledge exchange.

Other suggestions given by less than 10 % of the sample worthy of note were the following:

- have a team as a subject matter expert rather than an individual: in that way they are commonly accountable and are forced to share knowledge openly.
- recognise everyone that has contributed to a project.
- publish accountabilities on the intranet to make sure that knowledge is openly shared

There were four significant between group differences with respect to the suggestions given to improve openness. Newer employees were more likely than more experienced employees to suggest that the organisation communicate the value of openness (82% of the employees with 5 years or less experience at Company A versus 25% of the employees with more than 5 years of experience). More experienced employees were more likely than less experienced employees to suggest: (1) conflict resolution training (58% vs. 0%), (2) a company objective for openness (50 % vs. 6%). Managers were more likely than non-managers to suggest a company objective for openness (42% vs. 12%).

6.4.13 Summary for openness

According to the respondents a truly open environment has the following characteristics: (1) no hidden agendas; (2) people don't take criticism personally; and (3) experts don't shield their knowledge. Using these criteria, the majority of respondents did

not feel that the environment in the R + D department was open, as the grades given for openness (mean: 60 %) show a lot of room for improvement.

Respondents articulated why they felt that the R + D department was not an open environment. Reasons included: (1) experts shielded their knowledge (i.e. they did not offer it when or where it was needed); (2) decisions were made for political reasons (i.e. there were hidden agendas, employees and managers did not publicly explain their decisions), and (3) there were communication problems (i.e. people did take criticism personally or did not communicate with other groups because of work related conflict).

On the other hand respondents felt that some aspects of the organisational culture were pointing to openness. The responses show a high link between trust and openness (i.e. tended to be more open when trust was high). Respondents typically felt that the relationship between co-workers was characterised by an open interaction and high trust. The reason for this seemed to be that co-workers had built up a personal relationship through socialising together. This finding is consistent with work by Handy (1995) who found that socialisation could lead to establish reciprocal trust. One in five of the respondents felt they could be open with their own manager. These respondents also stated that they trusted their manager. This again is linked to trust, good relationships and the managers' communication style (i.e. they send out signals that they are approachable).

The data also suggest that people who were open themselves tended to encourage openness in others. People who were not open themselves (i.e. experts, colleagues in other departments) seemed, on the other hand discouraged this type of behaviour in others.

While people tended to be open with their own colleagues they were less likely to be open with people in other groups. This is consistent with the idea that came up earlier,

that knowledge is more likely to be shared with employees when there is a social-relationship. Respondents were more hesitant to share knowledge with people they see less often. This could be due to the fact that they had no opportunity and time to build up trust. Also, with colleagues in other departments, communication difficulties and conflicting goals (i.e. who gets recognised, who gets the credit) appear to reduce openness.

Explicit knowledge that employees must have to do their job seemed to flow freely and openly. The type of knowledge that was freely flowing was not, however, the type of knowledge that employees perceive to be highly "valued" (i.e. mission critical knowledge, tacit knowledge, knowledge that distinguishes the expert). Other types of information seemed not to flow freely at all including political information, information necessary for planning, and tacit information. Respondents felt that the reasons why this knowledge was not shared could be attributed to distrust, politics (self interest) and the fact that information got stuck in the hierarchy (i.e. at the middle management level.)

When looking for solutions the focus should be on experts and managers as these groups hold the most tacit knowledge. A change in the organisational culture towards a culture of sharing knowledge would change who gets rewarded - with those who shared knowledge getting positive recognition while those who hoard information do not. Getting experts who are presently seen to shield their knowledge, and not share it, to exchange knowledge openly seems to be critical to an open environment. Targeted efforts need to be made to bring this group onside. Another important solution seems to be to increase the opportunity for social interaction which, in turn, may lead to increased trust and a more open exchange of explicit and tacit knowledge.

There are a number of consistencies between the findings reported by O'Reilly (1989) and the responses given by this sample. Commonalties include the following: (1) respondents felt that open communication and better listening has to be rooted into the organisational culture for knowledge sharing truly to happen. (2) people have to be moved around to get to know co-workers in different departments and build up diverse network of social relations, and (3) employees need to be willing to ask 'dumb' question. Where O'Reilly (1989) and Company A seem to have different beliefs is with respect to the issue of conflict. Whereas at Company A conflict is perceived to be negative, O'Reilly gives the examples of innovative companies that expect open conflict. These companies believe that conflict is common in knowledge intensive industries where bright people with strong egos clash. At Intel Corporation for example, all employees are told to expect conflict and to deal with it directly and openly. To resolve conflicts at Intel, employees are trained in a process called "constructive confrontation", which helps them deal with the conflict in productive rather than destructive ways (O'Reilly 1989). In contrast to Intel, many employees in the studied company did not understand that conflict is expected and has to be addressed directly. IT may be that training on conflict resolution (a suggestion given by respondents) could help the company in this regard.

6.5 Indicators of trust:

The fifth section of the interview included questions to explore the concept of trust.

6.5.1 Question 31: How would you define trust?

As Table 28 shows five sets of responses were given by more than 10 % of the interviewees. In their definition of trust nearly 60 % respondents explained that when they trusted a person they believed that the other person would not use shared knowledge against them. Interviewees added that the other person would not "back-stab" them, or in other words, do things to hurt the individual behind that person's back.

Definition of trust *	Overall	Non Managers	Managers
Other person will not use knowledge against me	59 %	47	75
Confidence in other's ability	38		
Respect	17		
Not offended by criticism	14	24	0
Honesty	14		

***Multiple responses allowed**

Table 28: Definition of trust

A completely different view was given by 38% of the respondents who linked trust to their confidence that the other person could get a job done properly (i.e. could believe their work: did not have to review it). Respondents added that this meant that you trust someone if you are sure that the person has the ability to do the job.

A third set of responses, given by 17 % of the sample pertains to the issue of respect. Interviewees that gave that answer defined trust as respect for the other person. In the fourth set of responses (given by 14 % of the sample) interviewees linked trust to their belief that the other person would not be offended by open criticism.

Finally it should be noted that 14 % of the sample gave answers that pertained to the issue of honesty. These respondents defined trust as the knowing that someone was honest with them and not shielding knowledge or using information to their own advantage.

Two significant between group differences were found. Managers were more likely than non-managers to define trust as another person not using knowledge against them (75 % vs. 47%). Non-managers were more likely than managers to define trust as the believe that the other person would not be offended by criticism (24% vs. 0%).

6.5.2 Question 32: How do you think trust relates to the culture of sharing knowledge at Company A?

Relation of trust to the sharing of knowledge *	Overall
Trust is essential	55 %
Nothing is shielded	45

*Multiple responses allowed

Table 29: Relation of trust to the sharing of knowledge

When asked how trust relates to the culture of sharing of knowledge, only two responses were given by more than 10 % of the sample (see Table 29). Just over half of

the respondents pointed out that trust has to be an essential value in a culture of sharing knowledge. In other words it was perceived as being absolutely necessary for real knowledge sharing and a real free flow of information. These interviewees emphasised the close connection between trust and the sharing of knowledge.

The second set of responses, given by just less than half of the of the interviewees, pointed out that when you have trust, knowledge is not shielded. The following quote typifies that response: "Only when you have trust, all knowledge is passed on and nothing is shielded."

One individual made an interesting observation regarding the company's ability to increase trust: "If you have direct competition of groups you can't have a high level of trust at the same time." There were no significant between-group differences in these data.

6.5.3 Question 33: Describe what the R&D department at Company A would look like if people truly trusted each other

Ideal world of trust *	Overall	≤ 5 Years	> 5 Years
Same objectives	38		
Confidence of getting credit	28	41	8
No finger-pointing	21		
More efficient	21		

*Multiple responses allowed

Table 30: Ideal world of trust

Respondents were able to articulate four characteristics of a workplace that is based on trust (seen in Table 30). Just under 40% of the interviewees felt that in an ideal world of trust all employees would have the same objectives. In this world trust, would be inherent in everything everyone does. Respondents added there would be no need for doubt whether there might be a political game involved, because employees who were working together could be sure that everyone had all the same objectives.

Just under 30% of the respondents thought that in an environment where everyone truly trusted each other, an employee could be sure that they would get the credit for the knowledge that they shared. Respondents added that they wanted to be sure that sharing knowledge would help them to advance. This would happen in an environment where everyone had trust that their colleagues would not use the knowledge for their own enhancement.

One in five respondents felt that in a ideal world of trust they would not have to worry about looking stupid. These employees added that there would be no "finger-pointing" to people that had made a mistake (i.e. same idea as that of respect). Also one in five respondents said that an environment of high trust would also be an efficient environment because it would not be necessary to verify statements and knowledge would not be shielded.

As Table 30 shows there was only one between group difference. In these data employees with less than 5 years of work experience were more likely than more experienced employees to describe an ideal world of trust as one in which you were confident of getting credit for the knowledge shared (41% vs. 8%). One possible explanation for this difference might be that newer employees still want to progress through the ranks and need credit from management to do so.

6.5.4 Question 34a: Please give the department a grade from 1 to 100 for trust.

The distribution of grades for this question can be seen in Figure 8. Only one individual of the sample did not want to answer the question. The trust scores given by the rest of the sample indicate that the majority of respondents feel that there is a high degree of trust between colleagues within R + D (mean score of 70 %). Over half of the sample gave their department a grade between 50 % and 79 % and just under 40 % gave an A - grade. Only three respondents felt that the department deserved a failing grade.

Figure 8: Distribution of grades for trust

Analysing the means of the subgroups for significant differences suggests that the grade given for trust was not associated with the years at Company A (mean for tenure $\leq$ 5 years: 65%; mean for tenure $>$ 5 years: 71%; $t = -0.83$; $\alpha = 0.41$), nor with job type

(mean for non-managers: 72%; mean for managers: 63%; $t = 1.01$; $\alpha = 0.32$) In other words, the bimodal structure can not be explained by between group differences.

6.5.5 Question 34b: Why did you give it this grade?

In this follow-up question, 4 responses were given by more than 10 % of the sample (see Table 31). One in three respondents explained their grade by noting that the percentage they gave reflected the number of people that they trusted within the department and felt would take accountability for what they did. One quarter of the sample explained their answer by saying that trust had improved significantly within the last years: "Nowadays there are clear objectives and well defined roles - groups don't compete against each other. So there is not that much distrust any more."

Reasons for the grade *	Overall	≤ 5 Years	> 5 Years	Non Managers	Managers
Grade reflects accountability	34 %	47	17	47	17
Trust has improved significantly	24	12	42	12	42
Company A does not promote trust	21				
Know people personally	21				

*Multiple responses allowed

Table 31: Reasons for the grade

The last two responses to be discussed were both given by one in five interviewees of the sample. The first of these responses identifies Company A as not promoting trust.

This was an explanation of people who awarded lower grades. These respondents did not clarify this answer. In the last set of responses interviewees stated that they knew most of the people personally and this lead to increased trust.

There were four significant differences in these data. Newer employees (tenure ≤ 5 years) and non-managers were more likely than more experienced employees (tenure > 5 years) to link the grade to the number of co-workers of the department they felt were accountable. More experienced employees and managers were more likely than newer employees and non-managers (each time 42 % versus 12 %) to point out that trust has improved significantly. In other words, newer employees and non-managers were more likely to link trust to their own experience with an individual while managers and those with more experience took a more historical view (i.e. it's better now).

6.5.6 Question 35: How can trust be improved?

Improvement of trust *	Overall	≤ 5 Years	> 5 Years	Non Managers	Managers
Team-building efforts	34 %				
Have managers lead by example	34			24	50
No fear of making a mistake	17	29	0		
Social events	17				

*Multiple responses allowed

Table 32: Improvement of trust

As can be seen in Table 32, four suggestions were given by more than 10 % of the sample on how the department could improve the level of trust. One third of the

respondents felt that more effort should be put to develop teams. These interviewees suggested that teams have to be helped in the initial stages when a new team is build. These interviewees felt that it was important that social relationships had to be fostered between specific employees and specific groups that had to work together in one project.

Another one third of the respondents thought that the situation would improve if managers would lead by example. The following quote typifies that answer:

"Managers should value trust, value honesty, value openness. They should encourage these values and the subsequent behaviours by leading by example."

A third set of responses, given by 17 % of the sample suggested that if the department could reduce the feelings many people had of making a mistake, they would see an improvement in trust. These interviewees added that they would be more trustful if the did not have to be afraid of looking stupid when they made a mistake. Another 17 % of the sample suggested to increase the level of trust with social events, as people could get to know other people in the organisation and build up the kind of personal relationship which was necessary for building up trust.

There were two significant between group differences in these data. Significantly more employees that had been with the company less than 5 years than had been with the company longer felt that trust could be improved by decreasing the fear of making a mistake (29% versus 0%). Managers were more likely than non-managers to suggest that managers lead by example to improve trust.

6.5.7 Summary for trust

Respondents to this study viewed trust in two quite different ways. First, trust was defined as mutual respect, honesty (i.e. trust was defined at a personal or individual level) and the proper use of information. Second, trust was defined as the ability to do a job (i.e. trust was defined at the level of job competencies).

Respondents repeatedly pointed out that employees must have mutual trust if knowledge is to be exchanged. Similar ideas were expressed concerning knowledge exchange based on trust, as were mentioned with respect to openness: (1) shared objectives are a prerequisite for trust, (2) employees need the feeling that they are respected by colleagues. Again, it was stated that the more employees seem to know people and deal with people the higher the level of trust.

Suggestions to improve the level of trust pertain to many of the same ideas that have been seen previously: (1) increase the opportunities people who work together have to get to know one another (through more systematic team building efforts especially at the initial formation of a team), (2) increase accountability and leadership within the R+D department (i.e. people have to behave trustworthy in order to be rewarded); (3) increase the level of mutual respect by focusing, valuing and rewarding respectful behaviours.

Employees see the concept of trust and the concept of openness as being strongly related. According to the respondents one needs trust to openly exchange explicit and tacit knowledge. Zand (1971) came to similar conclusions when researching trust and managerial problem solving. He found that when people trust each other they: (1) disclose more accurate, relevant, and complete data about the problem, one's thoughts and one's

feelings; (2) accept more influence from others in selection of goals, choice of methods, evaluation of progress; and (3) accept more interdependence with others and have greater confidence others will do what they agree to. As this research shows, those findings can also be transferred to the relationship of trust and the sharing of knowledge.

Sitkin & Roth (1993) linked trust to cognition and feelings about the extent to which another person can be relied upon and shared values and standards. This is consistent with the views expressed by respondents who felt that people who work together within teams and exchange knowledge can do so effectively only if they trust one another. Otherwise respondents mentioned that they had to devote a lot of time and energy to verify the knowledge received from others.

Respondents emphasised that in order for them to share valuable knowledge they had to trust their colleagues to use the information in a way that would not decrease their value to the organisation. In other words, in an environment of trust people share knowledge and don't worry about their job security or their perceived power within the organisation. Trust should, therefore, be the norm within an organisational culture that truly fosters the sharing of knowledge.

6.6 Indicators for the availability and use of communication channels:

In the sixth section of the interview the availability and the use of communication channels was researched in a more detailed manner.

6.6.1 Question 36: How would Company A look like if there was perfect communication of knowledge?

As Table 33 shows, respondents were able to identify 4 things, which characterised a work environment where there is perfect communication of knowledge. Nearly half of the respondents felt that employees would communicate why they have made a particular decision in a certain way, not just the decision. Respondents added that this meant that there would be no hidden politics, no hidden agendas, and a transparent decision-making. The following quote illustrates this response: "When there is perfect communication the decisions of directors and upper management would be communicated downwards."

Perfect communication of knowledge *	Overall	Non Managers	Managers
Communicate reasons for decisions	45 %		
Push information to recipients	31	12	58
Use of the appropriate channel	21		
Increased communication between teams	14		

***Multiple responses allowed**

Table 33: Perfect communication of knowledge

Nearly one third of the sample thought that in a perfect world of communication, important information would be pushed more to recipients instead of them having to search for it. Respondents added that important information should be delivered to them instead of them having to go out and actively search for it. Some respondents added that this could be implemented by email groups.

One in five respondents felt that in an environment where perfect communication occurred "the media would be matched to the message". Interviewees clarified this by adding that email would not be used for ambiguous messages. Interviewees also pointed out that different personalities preferred their information to be communicated in different ways (i.e. some people liked meetings, some liked to look for information on the intranet). To these respondents, this implied that in a perfect environment important information would be communicated through a number of different channels.

In the last set of responses 14% of the respondents pointed to the issue of communication between different teams. These respondents felt that in a perfect work environment there would be much more and better co-ordination and communication between the different teams. The following quote typifies this response:

"there would be no barriers between different projects and different parts of the company like Company A semiconductors and the rest of Company A. There is a us and them mentality that inhibits the communication between the different groups. In a perfect world these barriers would not exist."

As seen in Table 33 only one significant between group difference was found. Managers were more likely than non-managers to feel that in an environment with perfect communication of knowledge information would be 'pushed' to recipients in a (58 % versus 12 %).

6.6.2 Question 37: what grade would you give for the availability and use of communication channels?

Figure 9: Distribution of grades for communication channels

The distribution of grades given for this question by respondents can be seen in Figure 9. The mean score for availability and use of communication channels was 68 % - a C+. Only 10 % of the sample gave a failing grade of less than 50 %. Over half of the sample gave a grade between 50 % and 79 % and just under 40 % gave an A - grade. These data would suggest that the majority of respondents were moderately happy with the availability of information in their department, still the score shows there is room for improvement.

As can be seen in Figure 9 the distribution is skewed to the high end of the distribution. The t-test shows no significant between group differences in the means

(years of service: mean for tenure ≤ 5 years: 68%; mean for tenure > 5 years: 72%; $t = -0.61$; $\alpha = 0.55$; or job type: mean for non-managers: 71%; mean for managers: 68%; $t = 0.33$; $\alpha = 0.75$).

6.6.3 Question 38: What does the department do well with respect to communicating knowledge?

Positive aspects of communication *	Overall
All channels are provided	55
Cross departmental teams	14
Email	14

*Multiple responses allowed

Table 34: Perfect communication of knowledge

As can be seen in Table 34 three responses were given by more than 10% of the sample to justify their grade. More than half of the interviewees (55%) of the sample attributed their positive grade to the fact that Company A is providing all channels for communication. Interviewees explained that communication channels like email, fax, telephone, intranet, internet, and memos are all available to them.

The second and third set of responses were both mentioned by 14% of the sample. In the second set of responses interviewees noted that cross-departmental teams help employees to overcome communication barriers between different departments. They noted that employees from different departments are included in one cross-functional team. This encourages employees from different departments and functionalities to

communicate to reach the goals of the project. The third set of responses pertains to the usefulness of email for communication. Interviewees felt that email is a good tool for communication and that employees at Company A generally use email in an adequate manner. These respondents mentioned that email is especially powerful to relay information to a lot of people at the same time.

The following quote which reflects the view of less than 10% of the sample is noteworthy:

"The weak link in communication is passing information up and down the chain of command, this kind of information gets stuck somewhere in the middle. Townhall meetings are good to come over that problem, but they are not enough."

6.6.4 Question 39: What makes it harder to communicate knowledge within department?

Barriers to communication *	Overall
Communication not valued	28
Lack of familiarity	24
Meetings with accountabilities	21
Inappropriate communication channel	17
Tools too difficult	14

*Multiple responses allowed

Table 35: Barriers to communication

Respondents were able to identify a number of things that made communicating knowledge more difficult (see Table 35). The most frequent response, given by over one quarter of the sample, was that the importance of communication was not promoted enough. The following quote illustrates this response:

"All communication channels are here. What is missing is the will of the people to communicate. So the will of employees to communicate with each other has to be increased by making the value of communication clear to them."

The second most frequent response, given by one quarter of the sample, pointed out that the barrier to better communication is a lack of familiarity between employees. Respondents felt they did not know each other well enough to communicate properly.

The third set of responses, given by one in five interviewees, pointed out that more meetings are necessary where experts agree on who is responsible for what. Not only are these agreements to be reached but this knowledge needs to be exchanged and communicated properly (i.e. to who needs to know).

In a fourth set of responses, given by 17% of the sample, respondents talk about how the use of inappropriate communication channels acts as a barrier to communication. These respondents felt that email in particular was being abused as it was not the appropriate communication tool for intensive discussions. These interviewees also felt that some co-workers sometime hid behind communication channels like voicemail and email. Fourteen percent of the interviewees saw difficult tools for communication, like intranet access, as a barrier to communication.

In the categories with less than 10% two ideas are worthy of mentioning:

- meetings are often unproductive as a clear agenda is missing. As a consequence too many meetings are needed to come to a conclusion.**
- newer employees and more experienced employees do not speak the same language - this causes a communication barrier.**

There were no significant between-group differences in these data.

6.6.5 Question 40: What could be done to improve the communication of knowledge?

As can be seen in Table 36 four responses were given by more than 10 % of the sample. The most frequent response, given by nearly 40 % of the sample, pertains to communication training. These respondents wished they had more training on communication. In particular, these employees wanted to learn about different communication styles and different reasons for communicating.

Suggestions for improvement *	Overall	≤ 5 Years	> 5 Years	Non Managers	Managers
Communication training	38 %				
Standardise on one system	34			24	50
Extend intranet	21	18	58	12	42
Push information	17				

*Multiple responses allowed

Table 36: Suggestions for improvement

One in three respondents felt that communication and exchange of explicit knowledge would be improved when the whole department standardised on one system. These respondents felt that this type of standardisation would solve the problem of different people being unable to read documents in different applications. These respondents perceived that there are too many different applications in the R & D department for different kinds of knowledge. One employee gave as an example the fact that he got Microsoft project documents that he is not able to read on his system.

One in five respondents suggested, that the department make better use of the intranet. These respondents pointed out that the intranet could be extended with discussion boards for ideas, new intranet tools for easier communication, and extended project websites.

In the fourth set of responses 17% of the interviewees suggested that information had to be pushed more to the employees (i.e. increasing the usage of email lists.)

The following quote expresses an opinion that while not commonly held, is worthy of note:

"Bring the outside world to us! That means bring us more information what products are out there at the marketplace, what other companies are doing. Communicate information from the outside in. This would really improve communication."

There were three significant between group differences in these data. Significantly more employees that have been with the company more than 5 years than employees that have been with the company less than 5 years felt an extension of the intranet would help to improve the communication of knowledge (58 % compared to 18 % with 5 years or less tenure).

Managers, on the other hand, were more likely than non-managers to suggest: (1) the company standardise on one system (50% versus 24%) and (2) the company extend the intranet (42% vs. 12%).

6.6.6 Summary for the availability and use of communication channels

Respondents could describe such a thing as a perfect environment concerning the availability and use of communication channels. This environment would have the

following characteristics: (1) people would match the message to the adequate media (for ambiguous information or tacit knowledge employees would use 'rich' channels like face-to-face interaction); (2) the company would be pro-active with respect to the dissemination of information (i.e. certain information would be pushed to recipients); (3) there would be a greater emphasis on transparency (i.e. employees and managers would communicate what the decision was, the rationale behind the decision, and how it was made without employees having to ask; an organisation where decisions are communicated that way is called 'transparent organisation' by Bill Gates ,1999); (4) a high level of communication between different teams, not just within the teams (i.e. communication and knowledge exchange between the different projects would be much better).

While respondents were generally happy with the availability and use of communication channels within the department (i.e. satisfied with the communication technology) employees still were able to identify communication barriers. Most of the barriers were, however due to how people used the different technologies (or did not use the technology as the case might be). The responses given might be connected to Daft and Huber's (1987) two perspectives on organisational learning. In the first perspective, the systems structural perspective, Daft and Huber see the organisation as a system for transmitting data. To transmit data, information or knowledge, communication channels have to be available and have to be used. Respondents to this study were satisfied at the structural level. In the second perspective, the interpretative perspective, Daft and Huber see the organisation as a system for giving meaning to data. Perhaps this is where the problems occur. The results in this section, and proceeding sections suggest that the information gets transferred, but the concrete purpose, meaning and consequences are not

shared. To address this problem Daft and Huber (1987) emphasise that the organisation learns by discussion.

Our results might indicate a relationship between the richness of the communication channel and the effectiveness of knowledge transfer. We argue that face-to-face interaction is the richest medium because of its capacity for immediate feedback and the availability of multiple cues (Daft and Lengel 1984) and creates the richest, most open social context through which knowledge is transferred most effectively. This is consistent with an underlying theme recurring through this research: respondents feel that the sharing of knowledge will improve if opportunities for social interaction increase.

Respondents saw room for improvement with respect of the communication environment. Many suggestions relate to those given earlier in sections pertaining the transfer of tacit and explicit knowledge and include: (1) good communication has to be valued with respect to rewards and the accountability structure; (2) people need social relationships with co-workers to properly communicate knowledge (i.e. deal with people rather than technology); (3) training on how to use communication media appropriately should be provided; and (4) technology can be made more communication enabling by standardising on one system and having more user friendly tools.

6.7 Indicators for top management support:

This section explores the relationship between top management support of knowledge sharing and a culture of sharing of knowledge.

6.7.1 Question 41: "What would Company A look like if it was the perfect work environment with respect to management support for the sharing of knowledge?"

As Table 37 shows six responses were given by more than 10% of the sample. The most frequent answer, given by nearly 40% of the sample, was that in a perfect world of top management support for the sharing of knowledge, top managers and managers would enhance the communication up and down the chain of command. Those who gave this response felt that at the present time too much information and knowledge is not communicated downwards. The following quote illustrates the response:

"Top management has to make the decision and the facts that lead to the decision or even the project cancellation clear to the employees. Even when it was a 'flip the coin' decision let the front line employees know. In engineering you have intelligent enough people to process and understand all these factors. Do not just cancel the project without follow-up communication. Basically much more information about decisions has to be communicated down to create a true culture of sharing of knowledge.

Perfect top management support *	Overall	≤ 5 Years	> 5 Years
Support of up and downstream communication	38 %		
Mentoring program	21	35	8
Help in getting knowledge	21		
Stated goal: knowledge sharing	21	12	42
Support of horizontal communication	21		
Information about task distribution	17		

*Multiple responses allowed

Table 37: Perfect top management support

The second to fifth set of responses were all given by 21% of the sample. The second set of responses pointed to a mentoring program. These respondents felt in order to support the sharing of knowledge top management should initiate a mentoring program especially for new employees. Such a program would allow these employees to get familiar with their work faster. Respondents felt that this program had to include knowledge sharing topics like: where to find knowledge, in which form to share it, and whom to ask for what kind of expertise.

In a related answer 21% of the respondents felt that managers should help to get knowledge from other groups. These respondents saw managers as facilitating the knowledge transfer in a more energetical and proactive fashion than those who gave the first response. The fourth response pertains to the issue of making knowledge sharing a company wide goal. Respondents who gave this answer felt that if managers made knowledge sharing a priority then resources would be spent to support the exchange of knowledge and it would become a company wide focus. The fifth response dealt with the support of top management for horizontal communication and knowledge exchange. Employees that gave this response felt that in a truly supportive environment managers would not insist that information had to flow through the chain of command. Instead they would support horizontal communication and not be afraid of losing perceived power.

Finally it has to be noted, that 17% of the respondents wished that managers would state in department meetings who is working on what. In other words they would create more intensive knowledge sharing links in the own functional groups. This would increase knowledge sharing between people who are in the same functional group but are working on different projects. This response was given previously with respect to the sharing of tacit knowledge.

An noteworthy quote of the feelings of some in the department was:

"In a truly supportive work environment for the sharing of knowledge top management would define a knowledge strategy. There have to be clear guidelines what knowledge is valuable, what knowledge is confidential, and what knowledge is important to be shared. Moreover there has to be worked out a goal for knowledge sharing. We don't want to share knowledge just for the sake that people know more. In the end we want an increase of our bottom line result and not just more work or an add on our current work.

6.7.2 Question 42: "What grade would you give for the support of top management to the sharing of knowledge?"

Figure 10: Distribution of grades for the support of top management

As can be seen in Figure 10 the distribution of grades given for the support of top management to the sharing of knowledge has a distribution which is almost normal distributed (slight skew to higher grades.) On an average, respondents gave 65 % for the support of top management. Broken down into three categories, 10 % of the respondents gave a failure grade of less than 50 %. Nearly 70 % of the interviewees gave a grade between 50% and 79 %. Just over 20 % of the sample gave an A - grade with more than 80 %.

Analysing the means of the subgroups for significant differences suggests that the view of how supportive the management at Company A is with respect to the sharing of knowledge is associated with the job type (mean for non-managers: 71%; mean managers: 56%; $t = 2.2$; $\alpha = 0.04$). The t-test shows that managers were significantly more likely than non-managers to give lower grades. This could indicate that non-managers saw their managers (i.e. middle management) as not hindering, but manager saw their managers (i.e. top management) as hindering the sharing of knowledge. There was no significant difference in the means of grades given from newer and more experienced employees

6.7.3 Question 43: What does your own manager do that makes it easier for you to share knowledge?

As can be seen in Table 38, three responses were given by more than 10% of the sample. The most common response, given by more than half of those interviewed, was a perception that their manager made it easier for them to share information by being open

and supportive themselves with respect to the sharing of knowledge. The following quote illustrates this response:

"My manager is supportive as he emphasises that any time I have a problem I can feel free to come and see him. This openness supports me in my communication behaviour as I can discuss any kinds of problems any time with him."

How is your manager supportive *	Overall	≤ 5 Years	> 5 Years	Non Managers	Managers
Manger is open	55 %				
Leading by example	38			24	67
Helps to solve problems	24	35	8	35	8

*Multiple responses allowed

Table 38: What does your manager do that makes it easier?

Over one in three respondents saw their manger leading by example. They felt that their manager showed the importance of communicating and sharing knowledge as it influenced her/his everyday management decisions. Interviewees felt that managers assigned resources such as time and money to the sharing of knowledge. Respondents gave the example of a weekly meeting where knowledge about problems and the status quo in different teams is shared.

One in four respondents saw their manager supporting the sharing of knowledge by not punishing them for mistakes. These respondents added that in the case of a mistake their manager jumps in and helps to solve the problem.

It is worthy of note that just less than 10% of the sample could not identify any way that their manager supported the sharing of knowledge.

Three significant between group differences were found. Newer employees were more likely than more experienced employees to think that their own manager made it easier for them to share knowledge by helping them in case of problem or a mistake made (35% versus 8%). Managers, in turn, were more likely than non-managers to feel that leading by example of their manager helps them to share knowledge (67% vs. 24 %). Non-managers were more likely than managers to respond that their manager is supportive of sharing knowledge by helping to solve problems (35% versus 8%).

6.7.4 Question 44: What does your manager do that makes it harder for you to share knowledge?

Only two responses were given to this question (see Table 39). The most frequent answer, given by just under half of the respondents, was that their manager did not show any sort of behaviour that would hinder the sharing of knowledge. The other set of respondents (38 % of the sample) pointed out that their manager has no commitment to the sharing of knowledge. These respondents felt that often necessary resources are not spent (i.e. time and money) to make it easier for employees to use and share knowledge.

How is your manager hindering *	Percentage
Not hindering	45
No commitment	38

***Multiple responses allowed**

Table 39: What does your manager do that makes it harder?

Two categories with approximately 10 % are worthy of note:

- Employees perceived their manager as being too busy for communicating and sharing knowledge with them.
- Managers are hindering the sharing of knowledge by insisting that all communication follows the organisation's hierarchy.

There were no significant between group differences in these data.

6.7.5 Summary for top management support

Respondents gave their management an average grade of 65% with respect to their support of sharing of knowledge. This score reflects the fact that a number of respondents felt that management were not allocating resources for the sharing of knowledge and were not recognising its importance. On the other hand, many respondents felt that their own front line managers were not preventing or hindering the sharing. While on the one hand, it could be said that the culture itself works against the sharing of knowledge. On the other hand, however, the literature suggests that managers form the organisational culture.

As O'Reilly (1989 p.20) notes:

"Management as Symbolic Action: This mechanism commonly seen in strong culture organisations is that of clear, visible actions on the part of management in support of the cultural values. In organisations, participants typically want to know what is important. One way employees gain this information is to carefully watch and listen to those above them."

This applied to the concept of a culture of sharing knowledge means that top management consistently has to deliver the message of the importance of the sharing of knowledge to create a culture where sharing of knowledge is valued. According to O'Reilly (1989) it is important that top management not only says that something is important but also consistently behaves in ways that support the message. Company A respondents concurred and stressed that managers should communicate more knowledge up and down the hierarchy and provide resources to support the sharing of knowledge. Respondents in this research felt that more resources should be spent on a mentoring program, and the systematic support of horizontal communication.

People who participated in the case study also complained that they did not have a clear sense of what the superordinate goals are, with respect to the sharing of knowledge and what knowledge is important. In this situation, according to O'Reilly (1989) managers have to send out signals frequently and consistently helping to reassure the goals. They do this by continually calling attention to what is important, in work and in action.

Relating to the answers given Nontaka (1995) suggests that top management should create a knowledge vision and develop a knowledge crew in order to support the sharing of knowledge. A knowledge vision gives corporate members a general direction what kind of knowledge is important and ought to be created and shared. Nontaka suggests that the knowledge crew created by the management should tap on diverse members of the organisation to bring in a diversity of insights and intuitions. In addition to that top management has to be aware that knowledge creation is taking place in the head of the employee that this knowledge represents an invaluable asset of the company.

6.8 Indicators for the influence of reward system

Questions in this section of the interview focused on the influence of the reward system on the sharing of knowledge.

6.8.1 Question 45: "What would the reward structure at Company A look like if it was designed to enhance the culture of sharing of knowledge?"

As can be seen in Table 40 only two answers were given more than 10 % of the sample. The most frequent answer, given by more than half of the interviewees, pertained to the issue of recognition from peers. These respondents felt that if the reward structure was designed to truly support the sharing of knowledge, there would be more recognition for sharing knowledge by peers. Interviewees explained that this meant that co-workers and the immediate management would recognise the sharing of knowledge through a 'pat on the back' or by showing appreciation. Other respondents suggested to recognise the good 'knowledge sharers' by funny cards that hang on bulletin boards. These cards would thank the knowledge sharer and also show their face.

Reward structure *	Overall	≤ 5 Years	> 5 Years	Non Managers	Managers
Recognition for sharing knowledge by peers	55	65	33	65	33
Acknowledgement from management	48			35	67

***Multiple responses allowed**

Table 40: Reward structure

Just less than half of the respondents thought that a reward structure designed for the sharing of knowledge would include acknowledgement from the higher level (i.e. management, top-management). These respondents imagined that as a special incentive for the sharing of knowledge as a dinner with one of the Vice presidents would motivate them. Another idea given by respondents was to acknowledge people that share knowledge well at the 'townhall meetings' in front of all people.

There were three significant between group differences in these data. Significantly more employees that had been with the company less than 5 years than had been with the company longer felt that an ideal reward structure that truly supported the sharing of knowledge would recognise the sharing of knowledge by peers more (65% compared to 33% with more than 5 years). Non-managers were also more likely than managers to give this particular answer (65% versus 33%). Managers, on the other hand, were more likely than non-managers to see acknowledgement from management in an perfect reward structure pertaining the support of the sharing of knowledge.

6.8.2 Question 46: Grade for the reward system and its connection to the sharing of knowledge:

The distribution shown in Figure 11 represents the grades given for the supportiveness of the reward system for the sharing of knowledge. The distribution is bimodal with one peak at around 0 % and the other peak at around 60 %. The average of grades given by respondents for this answer was 49 %: failing grade. One quarter of the sample gave less

than 50 % as a grade, around 60 % gave a grade between 50 % and 79 % and 17 % gave an A - grade.

Analysing the means for between group differences suggests that the view of how supportive the reward structure for the sharing of knowledge is, is not associated with the years or service at Company A (mean for tenure ≤ 5 years: 49%; mean for tenure > 5 years: 52%; $t = -0.29$; $\alpha = 0.77$). However, managers were more likely than non-managers to give lower grades for the reward structure (mean for non-managers: 59%; mean for managers: 38%; $t = 2.15$; $\alpha = 0.04$). This might suggest that especially managers are dissatisfied with the reward structure.

Figure 11: Distribution of grades for reward system

6.8.3 Question 47: How does the current reward system encourage the sharing of knowledge?

Encouragement through the reward system	Overall	Non Managers	Managers
No encouragement	76	65	92
Recognition programs	14		

Table 41: Encouragement through the reward system

There were only two responses to this question (see Table 41). The most frequent answer, given by three quarter of the respondents, was that there is no formal encouragement within the reward structure for the sharing of knowledge. These respondents could not see anything in the current reward system that would encourage them to share knowledge. This finding is cause for concern given the importance accorded to rewards in the literature and by respondents in other sections of the interview.

The second response, given by 14 % of the sample, dealt with the issue of recognition programs as part of the reward system to encourage employees to communicate information and to share knowledge. These respondents added that extra efforts to share knowledge also got rewarded with extra incentives. One respondent gave the example that they got T-shirts from another group for their extra-work done.

There was only one significant between group difference in these data: significantly more managers (92%) than non-managers (65 %) felt that there is no encouragement in the current reward system to share knowledge, a disturbing finding given the earlier statement that managers, in many ways, create the company culture.

6.8.4 Question 48: How does the current reward system hinder the sharing of knowledge?

Discouragement for knowledge sharing *	Overall
Not enough recognition	55
Not an objective	41
Punishment of wrong behaviours	21
Rewards focused on innovation	14

*Multiple responses allowed

Table 42: Discouragement for knowledge sharing

As can be seen in Table 42, there were four responses to this question given by more than 10% of the sample. As the most frequent response, over half of the interviewees (55% of the sample) felt discouraged by the lack of recognition for the sharing of knowledge. These interviewees added that co-workers and management did not recognise them for their sharing of knowledge and they were not rewarded for that behaviour. One employee illustrated this with the following quote: "As I am not rewarded for the sharing of knowledge, why should I bother sharing?" Some of the interviewees even derived from the lack of reward a counterproductive behaviour typified by the following quote: "As there is no reward for sharing, individuals will shield knowledge to 'shine brightly' as everyone has to come to them and ask."

The second set of responses pertained to the issue that sharing knowledge is not an objective in the performance review. These interviewees felt that the current reward system is discouraging the sharing of knowledge by not stating it explicitly as an

objective in the performance review. Because it was not in the performance review, many employees felt that the sharing of knowledge was perceived as not important. The following quote illustrates this response:

"People with very poor communication and knowledge sharing skills are promoted to a manager level. So what does that communicate to the employees? Communication and knowledge sharing skills are not valued, they are not important to move ahead. As a consequence of this many employees ask themselves why they should share knowledge if it is not rewarded"

The third set of respondents felt that the current system rewards the wrong behaviours. As a consequence of this these employees felt that the current reward system not only does not reward the sharing, but it punishes other behaviours such as late delivery and poor quality. These interviewees added that this motivated people to focus on time to market and quality and not on sharing or communicating knowledge.

In a related response 14 % of the sample felt that rewards are focused on innovation and not on knowledge sharing and that these two forces - the reward for innovativeness and the sharing of knowledge - act against one another. Some interviewees illustrated this response by giving the following example: "The patent reward hinders the sharing of knowledge, because everyone is holding back his new inventions until they are patented." No significant between-group differences were found in these data.

6.8.5 Question 49: How could the reward system be changed to enhance the sharing of knowledge?

When asked to suggest changes in the reward system which would enhance the sharing of knowledge 10% or more of the sample came up with the 5 suggestions shown in Table 43. The most frequent response (59 % of the sample) was a suggestion that top management publicly recognise employees that have done an outstanding job in sharing knowledge. Interviewees added that top management should validate this person's behaviour by talking to the project manager, the person who usually has a very good impression who the key contributors in a team are. Other examples to raise public recognition suggested by respondents were that top management should broadcast by an email the outstanding knowledge sharing contribution of key members. More suggestions given by respondents were a dinner with the VP or a personal thank-you from a top manager.

Change in the reward system *	Overall	≤ 5 Years	> 5 Years	Non Managers	Managers
Public recognition from top management	59	77	33		
Make it an objective	44			24	75
Monetary rewards	24				
'Employee of the month'	14				
Don't give monetary rewards	14				

*Multiple responses allowed

Table 43: Change in the reward system

The second most frequent answer, given by 44% of the sample, dealt with the issue of adding the sharing of knowledge to the performance objectives. These respondents felt that making the sharing of knowledge an objective in the performance review would then, in turn, motivate them to allocate time and effort to the sharing of knowledge. The suggestions of one employee illustrate this response:

"Top management has to be more explicit that being a good communicator is required to move ahead. More emphasis on communication would help the company a lot."

One quarter of the respondents would like to see monetary rewards for the sharing of knowledge. The following quote typifies the response:

"More recognition doesn't get me anything, give me monetary rewards; I helped to save \$X, and I want a commission based on that."

In the fourth set of responses interviewees suggested a publicly recognised: 'employee of the month', who has been brought forward by colleagues. These respondents thought that top management then would investigate and mention names or give awards for an excellent job in sharing knowledge. Another employee suggested the following scenario:

There should be little, funny pictures all over the department: thank you Linda for sharing knowledge with me. You've done a fabulous job at sharing knowledge for my project.

Another 14 % of the respondents felt very suspicious of monetary rewards for the sharing of knowledge and believed that monetary rewards should not be given for the sharing of knowledge, as people might then play games or cheat in order to get these monetary rewards.

The following quote typifies a response given by less than 10 % of the sample that is worthy of note:

"Key employees have to be recognised. It is especially important to keep these experienced workers otherwise too much valuable tacit knowledge leaves the company. So key employees have to be given monetary rewards to keep them at the company and to spread their knowledge and experience."

There were two significant between group differences in these data. Significantly more employees that have been with the company less than 5 years than have been with the company longer suggested the company change the reward system in a way to have public recognition from top management (77% compared to 33% with more than 5 years).

Managers, on the other hand, were more likely than non-managers to suggest that the sharing of knowledge should be tied into the performance objectives.

6.8.6 Summary for reward system

Respondents are not satisfied with the current reward system as it relates to the sharing of knowledge (mean score of 49%, a failing grade). Respondents felt that there is no real mechanism for rewarding the sharing of knowledge.

This section of the interview suggests that there are no rewards or recognition for the sharing of knowledge: it is not in the performance objectives, there are no formal rewards given for the sharing of knowledge, no informal rewards, and many times ideas are criticised and the shielding of knowledge is accepted. What is in fact happening? Rewards for sharing knowledge are not in employees' performance objectives and little recognition is given (formally or informally; by peers or management) for sharing. In fact, shielding behaviours are often the ones that are inadvertently rewarded.

What kind of rewards did respondents want? The interviewees identified rewards in two forms: (1) informal rewards (i.e. recognition) from peers and (2) formal rewards from top management. The large gap between a reward system that truly supports the sharing of knowledge with informal and formal rewards and the corporate reality was reflected in the failing grade given to this aspect of the culture and. To fix this problem interviewees asked for formal rewards and informal recognition from peers, and more programs to recognise good sharing of knowledge by peers and top management.

The responses with respect to how the reward system influences the sharing of tacit and explicit knowledge is consistent with the general statements of O'Reilly (1989) about comprehensive reward systems. Respondents repeatedly emphasised the importance of recognition of peers and top management rather than monetary rewards. As O'Reilly (1989) points out systems that focus on rewards such as recognition and approval can be given more frequently than monetary rewards. These rewards also focus on the intrinsic aspects of the job and a sense of belonging to the organisation (O'Reilly 1989). According to O'Reilly (1989) recognition by the boss or by co-workers for a certain behaviour can be more potent in shaping behaviour than an annual bonus.

Often one type of behaviour is desired while another is rewarded. This danger also existed in the studied company: in fact wrong behaviours - like the shielding of knowledge - were rewarded by promoting experts and the failing with the trial of new ideas was punished. According to Nontaka (1995) a culture that values innovation, knowledge creation and knowledge sharing contradicts itself, when the slightest failure is punished and things have to be done in a pre-determined way. Nontaka suggests to establish a different performance-evaluation criterion, where employees should be allowed to make meaningful failures to gain experience.

6.9 Suggestions for improvement

In the last section of questions suggestions for improvement were collected and the employees were asked to set priorities for the improvement process.

6.9.1 Question 50: How good are you personally at sharing knowledge? Give yourself a grade from one to 100!

Figure 12: Distribution of grades for own sharing of knowledge

Figure 12 shows how interviewees graded themselves with respect to their ability to share knowledge. Respondents gave themselves high scores: The average grade given by the respondents to themselves was 79%! This is the highest mean grade observed in this

research. No respondent gave themselves a failing grade with less than 50%. Just over 40% gave themselves a grade in the range between 50 % and 79 %. Most of the interviewees gave themselves an A - grade for their own knowledge sharing behaviour. The lowest grade given starts at 60 percent. This indicates that most interviewed people perceived themselves as very good in knowledge sharing which suggests that they think the problems and issues presented earlier stem from other peoples behaviours not their own.

Analysing the means for between group differences suggests that the view of the own knowledge sharing behaviour is not associated with the years of service at Company A (mean for tenure ≤ 5 years: 80%; mean for tenure > 5 years: 78%; $t = 0.47$; $\alpha = 0.64$), nor with job type (mean for non-managers: 81%; mean for managers: 77%; $t = 1.31$; $\alpha = 0.20$) In other words, no significant between group differences were found.

6.9.2 Question 50a: Why did you give yourself this grade?

Explanation for own grade *	Overall	Non Managers	Managers
<i>Positive aspects</i>			
I offer my knowledge	59 %		
I am an open person	55		
<i>Negative aspects</i>			
Don't make my knowledge explicit	28		
Sometimes I don't ask 'dumb' questions	24		
I am too busy to communicate	14	12	50

*Multiple responses allowed

Table 44: Explanation for own grade

This follow-up question tried to determine the reasons for the grade given. As can be seen in Table 44, 59% of the interviewees justified their grade by indicating that they personally offered their knowledge very freely any time they were aware of somebody needing their expertise.

Over half of the respondents felt that they had a very open personality and therefore gave themselves with a high grade. These interviewees added that they liked to communicate and they were taking extra efforts and time to send out emails with knowledge and updated information. One individual summarised the perception of this group as follows: "I think communication is very important and I share a lot of knowledge."

To explain why they did not give themselves a higher grade, 28 % of the respondents stated that they were not making enough effort to transfer tacit knowledge into explicit knowledge. These interviewees thought this was necessary to share their knowledge most effectively with a wide range of people. One manager illustrates the consequence

"My weakness in knowledge sharing is that I don't communicate to the broader spectrum: I only communicate to the teamleaders of my department in a face to face manner and not enough to frontline employees and to managers in other teams that are working on the same problem."

The second most frequent explanation of why respondents did not give themselves a better grade (given by one quarter of the sample) related to not asking enough questions. These interviewees felt that that they often did not dare to ask the 'dumb' questions. They did, however not that by not asking these questions they did not gain critical knowledge.

Finally it should be noted that 14 % of the interviewees explained that they did not give themselves a higher grade, because they felt that they are often too busy to share

knowledge and to communicate. This group noted that as their days were so packed with urgent tasks that they found no time for sharing knowledge.

One quote that is worthy of note illustrates a very negative response given by less than 10 % of the sample:

"I don't share knowledge too much. I don't trust many people around here. I got burned a few times and now I don't trust people anymore. This is not going to change. You can't do anything about that."

As Table 44 shows only one significant between group difference was found. Managers were more likely than non-managers to feel that they are too busy to communicate and share knowledge (50% versus 12%). This is unfortunate, as communication from this group downward and to other groups is what many respondents want.

6.9.3 Question 51: Do you need anything that would help you to share knowledge?

What people need: *	Overall	Non Managers	Managers
Overview of company-wide knowledge	31 %		
Vision of Company A for the future	24		
More use of available channels	17	29	0
Management support	17	6	42
Standardise the tools	17		
Communication training	14		

*Multiple responses allowed

Table 45: Change in the reward system

As Table 45 shows, 6 responses were given by more than 10 % of the sample. All 6 responses were given by 15% to 30% of the sample, suggesting there is not consensus with respect to how this problem could be solved. The most frequent answer, given by one out of three respondents, related to an overview of company wide knowledge. These respondents felt that they needed to know what other people in their group and in the other parts of the organisation knew. The quote of an interviewee illustrates this response:

"What do I need? I need to have information that is created in a different department. I give you an example: I have heard that there is another group in another department that does competitive analysis. I need these results to have a better understanding what I should do and in which direction I should go with my work. I have only heard that this group exists. Can you imagine that I have no idea where they are, I have no idea who they are, I have no idea how I could set up a contact with them. I have no access to the results. I need to have these results to understand how to make our product better. If that's not possible I at least need more information about our current and past products in my field and why decisions were made in a certain way. I need an overview over the marketplace. I need a product library. This means a library with all the products at the marketplace."

Another suggestion relating to the response to give an overview of company-wide knowledge was to improve on the fact that it was very hard to find people that have a specific knowledge. The suggestion of this individual was to set up intranet sites with face, name and skills in a way that people would be able to locate experts and knowledge in the company more easily.

One quarter of the respondents felt that they needed to have a better understanding where Company A is heading with its business strategy. These respondents wanted to have an overview over the different product lines, and they felt they needed to have at least an overall understanding of the markets they were in. Interviewees felt that this understanding would facilitate their day-to-day work and give them a better

understanding of their job. This increased understanding could, in turn, help them set priorities and work more effectively.

A third set of responses, given by 17 % of the interviewees, pertained to the issue of making more use of available communication channels. These employees felt that they were not missing any tools for communication and knowledge transfer: Rather the issue was inadequate use of what is available. These respondents illustrated the situation as: "you can lead a horse to the water, but cannot make it drink." Some of these employees explicitly stated that they needed to improve on communication and knowledge exchange with other groups. The following quote typifies that answer:

"I need a more open, intensive and better working relationship with a certain group. They have to value my work and the tacit knowledge that has been flowing into it. They must not re-work everything we do. We have all the communication tools, but we just have to communicate better."

Another 17% of the interviewees felt that they needed more explicit support from top management. For these employees this meant that top management had to assign resources to the sharing of knowledge. Respondents defined resources as man-hours as well as money. One suggestion of an employee was to assign one person explicitly to facilitate the knowledge transfer and knowledge exchange. Other respondents suggested top management should spend more man-hours on meetings and seminars.

Another 17% of the sample mentioned that the different applications and systems have to be merged and standardised. These employees thought that there has to be a decision to standardise on one tool, which is easy to use. This response is quite different to the others as it was the only one that described a technical approach or solution.

Finally it should be noted that 14 % of the respondents felt that they needed communication training. From this training these interviewees expected to be taught how

to share knowledge effectively, how to solve negative conflicts and what knowledge should be shared.

One quote that illustrates a response given by less than 10 % of the sample is noteworthy:

"Less experienced employees need proper training in how things get done. This could be done through seminars. The problem is, most engineers are not interested in putting a presentation together"

As Table 45 shows there were two significant between group differences in this data. Non-managers were more likely than managers to relate to the issue of making more use of available knowledge transfer channels (29% vs. 0%). Managers, in turn, were more likely than non-managers to point out that they needed more top management support for the sharing of knowledge (42% vs. 6%).

6.9.4 Question 52: "What one thing, if it were changed or done, would most improve knowledge sharing?"

As Table 46 shows five responses were given by more than 10 % of the sample. As can be seen in the table the overall percentages add up to more than hundred, because for many interviewees it was very difficult to think of only one thing that would help the most.

Priority *	Overall	≤ 5 Years	> 5 Years	Non Managers	Managers
State knowledge sharing as organisational goal	34 %	18	58		
Clear overall picture	34				
Enhance trust	28			41	8
Facilitate companywide knowledge exchange	14	24	0	24	0
Increase communication across projects	14	0	25		

*Multiple responses allowed

Table 46: Priority

The first two sets of responses were both been mentioned by one in three respondents. One third of respondents felt that the most positive thing that could be done to bring about a culture of sharing knowledge would be to state knowledge sharing as an organisational goal. One interviewee explained why this should be the priority:

" Sharing of knowledge should be made a goal of the department. As a consequence of that time and money will have to be spent on sharing knowledge. Moreover when it is a stated goal it would also affect my performance review more and it would be a factor to help me advance. This would motivate me to spend more efforts on sharing knowledge. This interaction of consequences would have the most leverage on knowledge sharing."

Interviewees felt that as soon as the sharing of knowledge was stated as an organisational goal, the culture in the R&D department would also change towards a culture where communication and the sharing of knowledge is valued more. Another consequence mentioned by interviewees when knowledge sharing is made an organisational goal was that top management would support it:

"There has to be at least one key person at a high management level (VP) that strongly supports the change towards a culture that truly values communication and sharing of knowledge. Top management has to support these values and provide resources and control the results over a long period of time. It doesn't help to start just one program. We are very good at starting programs, but it has to be ongoing and the status has to be checked regularly."

The second set of responses given by one third of the interviewees, related to provide employees with an overall picture where Company A is heading. These respondents felt that if they had a clear understanding where Company A wants to go and what the main objective of different projects was they would understand much better what knowledge to share and with whom. Employees that gave this response felt that they needing a "birds eye" perspective to set priorities. The following quote illustrates this response:

"Top management has to give us a clear vision where Company A wants to be in the future. This is the weak link: the information about where Company A is heading does not flow up and down the chain of command."

A third set of responses given by 28 % of the sample pertains to the issue of enhancing trust. These respondents thought that enhancing trust would have the most positive impact with respect to the creation of a culture of shared knowledge. Some employees suggested that trust could be encouraged by making employees more familiar with their co-workers through social events that lead to building up social relations. Other suggestions with respect to enhance trust are given in section 6.5 of this chapter.

Fourteen percent of the interviewees felt the company wide exchange of knowledge should be facilitated by making who know what and who is doing what more visible. One employee explains why this should be the priority:

"I need to be made more aware of: Where do I need to go to get a specific kind of knowledge? Whom do I need to approach to get a specific knowledge? I have to find these answers to these questions with less effort. One solution would be to put experts on the intranet with their picture their objectives and their key

responsibilities in that project, another solution would be to have on person that would know whom to address. This should be the priority because nearly all necessary knowledge already is somewhere within this company, I just cannot find it.

Respondents that gave this answer often suggested that the company use the intranet to increase the visibility of knowledge that is already in the company. The following quote illustrates this response:

The priority should be to make knowledge exchange within the company easier. For that purpose project websites should be extended. It could be posted on those sites: what are the risks involved at the project? What are the new and exciting things at the project? Who is working on it? What are current problems and issues? Where are links to other projects? What knowledge can be reused? Does anyone have solutions for this problem? This web page could also be used to enhance recognition by posting: Thanks to so-and-so, he helped us solve this problem by providing knowledge about this particular field."

Finally it should be noted that 14% of the respondents felt that increased communication across different projects should offer the most help with respect to creating a culture of shared knowledge. These respondents reasoned that often different projects implemented very similar or even precisely the same solutions independent of each other. These interviewees saw that one consequence of not exchanging knowledge was wasted manpower.

Five significant between group differences were found. Significantly more employees that have been with the company less than 5 years than have been with the company longer felt that the priority should be to facilitate company wide knowledge exchange (24 % vs. 0%).

Employees that have been with the company more than 5 years, were more likely than newer employees to suggest as the priority: (1) knowledge sharing as an organisational goal (58% vs. 18%), and (2) increasing communication across the projects (25% vs. 0%).

Non-managers were more likely than managers to feel the following were priorities: (1) enhancing trust (41% vs. 8%), (2) facilitating companywide knowledge exchange (24% vs. 0%).

6.9.5 Summary for suggestion for improvement

When analysing the last section of questions it is striking that the grades given by the employees for their own knowledge exchange are remarkable high (mean 79%). Respondents felt that they earned this good grade, because they perceived themselves as open people offering their knowledge wherever needed. Respondents felt that what they needed the most an overview of what knowledge is already available in the company and an a clear vision of Company A to judge what is important and what is not.

The two most popular suggestions with respect to how knowledge sharing could be enhanced included: (1) making knowledge sharing an organisational goal, and (2) give employees at Company A a better overall picture of where the company is heading and what their own contribution has to be. Respondents believed with including knowledge sharing in the organisational goals resources would be spent to foster this wanted behaviour. Drucker (1988) stressed that in knowledge based industries it is important to give specialists a vision and a view of the whole to unify their individual efforts towards a common goal. This is exactly what respondents felt they were missing.

7 Conclusion

This chapter will try to summarise the several underlying patterns that reoccurred during the interviews. To begin, relevant conclusions are drawn for each of the research questions. Three questions were asked in each subsection of the interview: (1) how would an environment look like that truly supported the sharing of knowledge; (2) what grades would you give, and (3) suggestions for improvement. To get a better idea of the underlying themes, 3 tables will be created which summarise the most frequently given response for each of these questions.

7.1 Openness

Openness seems to have more of an impact on the sharing of tacit knowledge than explicit knowledge. The respondents indicated that openness is essential to the sharing of knowledge. Experts play an important role for the tacit knowledge exchange, as this knowledge often resides in their heads. Many respondents felt that experts were not open and shielding their knowledge, especially in their dealings with other groups. The data indicated that in the own group, social relations were usually very good. This resulted what resulted in a higher degree of openness and more sharing of tacit knowledge. These data suggest that openness is very important to sharing of tacit knowledge.

Explicit knowledge sharing, on the other hand, seems to be less dependent on openness and more dependent on technology. Respondents noted that technology helps to transfer and exchange documents (i.e. technology supports the open flow of explicit knowledge). It has to be added that most of the openly exchanged documents were

associated with low value: in other words there was no open exchange of valuable information. This research would suggest that an open environment is key for mission critical and experience rich knowledge to be shared. Often self-interest is a reason that information is not passed on.

7.2 Trust

In this research the data indicate that the concept of openness and the concept of trust are strongly correlated. As a consequence, answers to research questions 2a) and 2b) are very similar to the ones given with respect to openness. Trust seems to be essential for any knowledge exchange to happen, especially the exchange of more valuable tacit knowledge. Trust seems to act as an enabler for the sharing of knowledge when it is linked to shared objectives and respect from colleagues. The data suggest that to built up and increase the level of trust personal, face-to-face contact and an established relationship are essential.

7.3 Communication

The data indicates that the following communication channels are available within the R+D department at Company A: face-to-face, email, phone, intranet, Lotus notes, shared drives and databases.

Tacit knowledge is shared face-to-face (90% gave this response). The personal quality of tacit knowledge makes it hard to formalise and communicate (Nonaka 1994). This is consistent with the finding that face-to-face communication is best suited to

transfer tacit knowledge (i.e. have a maximum number of cues to evaluate what they mean, Daft and Lengel, 1984).

Respondents indicated that database, intranet and face-to-face were used to share explicit knowledge. In other words, respondents feel that they need less information rich channels to transfer explicit knowledge. Nontaka (1985) writes that explicit knowledge creation is a 'combination' of different pieces of existing explicit knowledge. To create explicit knowledge therefore requires individuals to exchange and combine knowledge through such media as documents, meetings, telephone conversations, or computerised communication networks. Therefore, for explicit knowledge to be created communication channels must be available and used.

There were few suggestions on how the organisation could explore the communication of knowledge as respondents thought that all necessary communication channels are available. The only suggestions for improvement were to systematically support the exchange of tacit knowledge by setting up seminars and a mentoring program. These provide information rich face-to-face contact in order to exchange and create tacit knowledge (Daft and Huber 1987). Daft and Lengel (1984, 1987) propose that media selection is closely linked to the amount of learning in organisations. This research might indicate that explicit knowledge is shared over communication channels that are low on richness (i.e. intranet, email, database), whereas tacit knowledge is shared over communication channels high on richness (face-to-face).

7.4 Top Management Support

The data indicate that top management influences the sharing of tacit knowledge by their behaviour (their leadership actions) and indirectly by their influence on the organisational culture. The data from this case indicate that within this R+D department while managers can not be said to hinder the sharing of knowledge, many do not overtly value it either. The data shows that management could facilitate knowledge sharing by allocating resources to support the transfer of knowledge. This means that management can support the sharing of tacit knowledge by allocating man-hours to seminars, and meetings to exchange experiences. They can also support explicit knowledge exchange management by investing in better technology (i.e. easy to use, better search and navigation structure) and standardising the knowledge systems. Moreover management can initiate a program to work out a knowledge structure binding upon the whole department.

7.5 Reward structure

According to the respondents in this research the reward system seems to be key to the development of an organisational culture that truly supports the sharing of knowledge. The motivation of employees to produce explicit knowledge and to share tacit knowledge seems to originate from two different forms of rewards: (1) recognition from peers, (2) formal rewards from top management. The data suggests that when no such reward systems exists, employees do not see it as important to share knowledge. As the reward

system has influence on the organisational culture (O'Reilly 1989) the challenge is to reward the desired behaviour.

7.6 What does a supportive environment look like

The case study would suggest an "ideal environment" with respect to each of the 5 construct studied in this research does exist. The following Table 47 shows the most frequent answer given of the 'how would a truly supportive environment look like?' question in each section.

Truly supportive environment*	Overall	≤5 Years	>5 Years	Non Managers	Managers
Reward structure: recognition for sharing knowledge by peers	55%	65	33	65	33
Openness: no hidden agendas	55%				
Sharing culture: communication and co-ordination between groups	45				
Communication: communicate reasons	45				
Trust: shared objectives	38				
Top management support: support of up and downstream communication	38				

*Multiple responses allowed

Table 47: Most frequent answers for a truly supportive environment

As Table 47 shows respondents have the most consensus around what a culture that supports the sharing of knowledge looks like with respect to reward structure and

openness. Over half of the respondents (55%) felt that a truly supportive environment would be characterised by co-workers that recognise and value the sharing of knowledge. Another 55% of the respondents pointed to a truly open environment with no hidden agendas. These two aspects seem to characterise an 'ideal world of sharing knowledge' and therefore managers should focus their change attempts in this area.

Just under half of the respondents (45%) described a truly supportive environment as one with communication and co-ordination, including knowledge exchange, between groups. The respondents of this research felt that that knowledge exchange in the own group is fairly good, but transfer of knowledge between groups and departments could be much better. According to the interviewed persons this inter-group exchange is an essential attribute of a culture of sharing knowledge. Another 45% of the sample thought that information and knowledge in an ideal environment concerning the sharing of knowledge would be passed up and down the hierarchy. Respondents wanted to know the reasons and decision criteria behind decisions.

More than one out of three (38%) respondents felt that in a culture that supported the sharing of knowledge where trust was present employees sharing would have the same objectives. Another 38% felt that in a culture of sharing knowledge top management would support the up and downstream of communication. The later issue already came up while examining the availability and use of communication channels.

Looking at the issues in Table 47 it can be seen that for a culture of sharing knowledge the reward structure has to be designed to reward knowledge sharing behaviour. Openness also appears to be essential. These two topics are strongly intertwined, as the data shows that in this organisation experts are perceived as shielding their knowledge and being not open. These data would suggest that experts need to be

rewarded in a different way (what is rewarded is done). In the studied company knowledge is connected with status and power. Within this culture many experts view the sharing of knowledge with a loss of power and value for the company. In other words, right now the shielding and not the sharing of knowledge is rewarded. In a culture of shared knowledge the opposite behaviour (i.e. the sharing of knowledge) has to be rewarded. What rewards should the organisation consider? Newer employees appear to be motivated by: recognition from peers, and formal appreciation from top management. There was no consensus form of reward that was especially motivating for more experienced employees (experts).

How close is the R+D department to having a culture of sharing knowledge? Table 48 shows the grades given in the grade questions ranked in descending order. This table should allow us to locate the best practices and weak points of the company that we studied.

Grade for	Mean
Own knowledge sharing	79 %
Trust	70
Sharing of explicit information	70
Availability and use of communication channels	68
Ideal 'culture of sharing knowledge'	65
Top management support	65
Openness	60
Sharing of tacit knowledge	57
Reward system	49

Table 48: Means of grades given

Where is the R+D department close to the ideal? Not surprisingly (question has a positive bias) respondents gave themselves high means with respect to their own knowledge sharing behaviour (Mean of 79%). Respondents think R+D's culture is supportive of knowledge sharing with respect to trust (I trust my colleagues), the sharing of explicit information, and the availability of the different communication channel. The fact that the average grade for each of these constructs was approximately 70% suggests that while in many ways the culture around trust, sharing of explicit information and the availability and use of different communication channels there is still room for improvement. Suggestions on how each of these grades can be improved are outlined by the respondents and in many cases reflect discrepancies between the ideal environment and the reality.

Respondents gave average grade of 65% with respect to two issues: how close their own culture is to the ideal culture of sharing knowledge, and top management support of the sharing of knowledge (top management was not hindering the sharing of knowledge, but they were not supporting it either by spending resources on it and rewarding it).

The grades given for openness (Mean of 60%) the sharing of tacit knowledge (Mean of 57%) and the reward system (Mean of 49%) were on the low end and reflect the need for improvement. Respondents felt that the R+D department was not a truly open place, because they perceived that experts shielding their knowledge. In fact, the idea of experts shielding their knowledge came up through the interview and suggest that this is a group that needs to be brought on side if the culture is to change. Experts seem to be a key group as they play a large role in the sharing of tacit knowledge (through their experience they are the owners of tacit knowledge). The worst grade given was for the reward

system, which seemed to reward the wrong behaviour (i.e. shielding of knowledge) and not supporting the sharing of knowledge.

7.7 Areas for improvement

Suggestions for improvement *	Overall	≤ 5 Years	> 5 Years	Non Managers	Managers
Rewards: public recognition from top management	59 %	77	33		
Openness: communicate value of openness	59	82	25		
Explicit knowledge exchange: training for knowledge retrieval	59	71	42		
Culture of sharing knowledge: Communicate importance of sharing knowledge	41	24	67	30	58
Communication: communication training	38				
Tacit knowledge exchange: recognise value of tacit knowledge	34			12	67
Trust: team-building efforts	34				
Priority: State knowledge sharing as organisational goal	34	18	58		

*Multiple responses allowed

Table 49: How to improve the sharing

The most frequent suggestions for improvement are shown in Table 49. These data are interesting in that they reflect a real consensus on the part of those who participated in the interviews with respect to what they think need to be done to change the culture in the

R+D areas towards one of culture sharing: (1) Openly value it (communicate you value it, change reward structure, communicate importance of sharing knowledge, public recognition from top management, recognise value of sharing, recognise value of tacit knowledge, make knowledge sharing an organisational goal), (2) train people on how to share with respect to trust. Here recommendations were slightly different to reflect the somewhat different nature of trust. Recommendations here relate to team building. The logic behind this recommendation is the link that people perceive between getting to know each other and trust.

Depending on the years of service with Company A, newer employees give quite different answer than more experienced employees. Newer employees were more likely to suggest the responses relating to immediate changes (public recognition from top management, communicate value of openness, training for knowledge retrieval). More experienced employees were more likely to make long term suggestions like stating knowledge sharing as organisational goal and communicating the importance of sharing knowledge. Managers were more likely than non-managers to suggest to recognise the value of tacit knowledge and to communicate importance of sharing knowledge.

The strongest reoccurring theme in the tables shown above (Table 47-49) is to change the reward system to enhance the desired behaviour: openness and sharing of knowledge especially concerning the experts within a company. Respondents in the study pointed out that two kinds of recognition were key: (1) recognition from peers for the sharing of knowledge and (2) formal awards from top management. This problem of compensating knowledge workers adequately seems to be very important for a culture of sharing knowledge.

Some authors (Drucker 1988, Davenport 1997, 1994, Butler and Waldroop 1999) think that the development of rewards, recognition, and career opportunities for specialists is essential to motivate these knowledge workers. Drucker (1988) extends this recommendation by noting that new opportunities and rewards for specialists should be built in the new knowledge based organisation. According to Drucker (1988) there is no easy answer to this question, as specialists themselves have largely rejected programs for alternative career development. To them - and to their management colleagues - the only meaningful opportunities are promotions into management and the prevailing compensation structure in practically all businesses reinforces this attitude because it is heavily biased towards managerial titles. The question to be solved remains: Why should experts share their knowledge, when they then, in turn, are less powerful and their probability of advancement decreases?

As some authors (Davenport 1994, Peters 1999, Geraint 1998), have already found, the key success factors of knowledge management systems were not the ability to solve complicated technical problems, but the human aspects of these IT systems. Companies that spend enormous financial resources on technology should abandon the idea that technology itself will solve a company's knowledge sharing problems. These companies are focusing on the wrong factors. The key factor to look at is the human side of these IT systems and how to motivate employees to share their knowledge.

7.8 Benefits

This research should benefit businesses in the following ways. First it should allow them to save time, (i.e. less need to re-invent the wheel) with respect to how to implement and manage KMS. Second, it should allow them to effectively implement needed knowledge management systems. As the business environment becomes more turbulent and time dependent, organizational productivity often depends on an in-depth knowledge of technologies, processes, and people – both in and across diverse functional areas (Nonaka and Johansson 1985). Recognising that knowledge can constitute a source of sustainable competitive advantage, managers implement technical solutions to these issues. It has however, been determined that the value of these knowledge management systems depend critically on the end-users willingness to share their knowledge. So despite the apparent theoretical benefits of sharing knowledge, the unwillingness in the part of the user to share knowledge often creates major problems in implementing KMS.

Cultural realities can act as barriers or enablers for knowledge management. Therefore the organizational culture concerning knowledge sharing has to be understood and taken into account (Rich 1999). Often it is difficult to get people to contribute ideas, either through on-line discussions or by submitting deliverables that have emerged from other work. Cultural barriers make the process difficult (Geraint 1998). People have to undergo a shift in mindset and culture, away from hoarding knowledge and towards sharing ideas (D. Garvin 1997).

A culture where explicit and tacit knowledge is shared can only be built, when the culture that enhances the sharing of knowledge is understood. This thesis makes the first

contribution to this field by suggesting that the culture can be shifted towards one that encourages sharing if one focuses on: trust, the reward structure, top management support, and face to face communication (social events). This information should also prove useful to practitioners who want to change to culture.

The company studied in this research has gained a more precise understanding of its culture of sharing knowledge as well as a picture of the factors influencing this culture and where its priorities should be with respect to changing this culture towards one that encourages the sharing of knowledge. Through gaining a clear picture of its own culture the studied company is able to gain a better understanding of its basic assumptions. Moreover the company gets invaluable ideas on how to improve tools for information exchange already in place. If the problems encountered by the specific company are typical for that industry the insights created in this thesis should be valuable for all these kind of companies.

7.9 Limitations

The main concern of this research is its generalizability, as only one department in a high-technology firm has been interviewed. The generalizability of this research may only be limited to R&D departments of high-technology firms with its characteristic culture.

Of concern may also be that we were interviewing only a small number of people. However this limitation was mediated by the fact that we were interviewing only in one specific department and by the fact that many of the interviewed people were at a senior level and had been with the company longer. As such they should have a better overview about the culture and the knowledge sharing habits and problems of the company.

It is to note that this is to be seen as only the start of research in the area of a culture of sharing knowledge, as many of the results (especially the bimodal distributions of grades given) could not be explained properly and hidden variable are suspected. It remains the challenge of future research to shed more light in this complex and interesting area.

8 Bibliography

Aldrich H., (1979), Organizations and Environments, Prentice-Hall, Engelwood Cliffs, NJ

Anderson E., Weitz B., (1992) The Use of Pledges to Build and Sustain Commitment in Distribution Channels, *Journal of Marketing Research* Vol. 21, No. 1, p.18

Argyris C., Schon D., (1996), *Organisational learning II: Theory, method, and practice*, Reading, Addison-Wesley, MA

Badaracco J., (1991), The Knowledge Link: How Firms Compete through Strategic Alliances, Harvard Business School Press, Boston

Bate P., (1994), Strategies for Cultural Change, Butterworth-Heinemann, Oxford

Beatty C., Gordon J., (1988), Barriers to the Implementation of CAD/CAM Systems, *Sloan Management Review*, Summer 1988, p.25

Beer M., Spector B., (1981), *Note on Reward Systems*, Harvard Business School Publishing, Boston

Benbasat I., Goldstein D., Mead M., (1987), The Case Research Strategy in Studies of Information Systems, *MIS Quaterly* September 1987, p. 369

Berg B. (1998), Qualitative Research Methods for the Social Sciences, 3rd ed., Allyn and Bacon, Boston

Berger P. and Luckmann T., (1966), The Social Construction of Reality, Penguin, New York

- Bostrom, R. (1989), Successful Application of Communication Techniques to Improve the Systems Development Process, *Information & Management*, Vol. 16 No.2, p.279
- Bradach J. and Eccles R. (1989), Price, Authority, and Trust: From Ideal Types to Plural Forms, in *Annual review of Sociology*, Scott W. and Blake J. (eds.), p. 97
- Brown A., Starkey K., (1994), The effect of organizational culture on communication and information, *Journal of Management Studies*, Vol. 31, No.6, p.807
- Butler T., Waldroop J., (1999), Job Sculpting: The Art of Retaining your best People, *Harvard Business Review*, September-October 1999, p.144
- Carnall C., (1997), Strategic Change, Butterworth Heinmann, Boston
- Chait L., (1999), Creating a successful Knowledge Management System, *Journal of Business Strategy*, March/April 1999, p.23
- Cooke R., Rousseau D., (1988), Behavioral Norms and Expectations, *Group & Organization Studies*, Vol. 13, No. 3, p.245-273
- Cooper D., Schindler P., (1998), Business Research Methods, Irwin McGraw-Hill, New York
- Cummings T., Worley C. (1997), Organization development and change, 6th ed., South-Western College Publishing, Cincinnati, Ohio
- Cutcher-Gershenfeld J. (1998); Knowledge-driven work: unexpected lessons form Japanese and United States work practices, Oxford University Press, Oxford

- D'Aprix R., (1996), *Communicating for change: connecting the workplace with the marketplace*, Jossey-Bass, San Francisco
- Daft R., Huber G., (1987), How organizations learn: a communications framework, *Research in the Sociology of Organizations*, Vol.5 No.1 p.1
- Daft R. L., Lengel R. H. (1984), Information richness: a new approach to managerial behaviour and organization design, *Research in Organizational Behavior*, Vol. 6, No. 2 p.191
- Daft R. L., Lengel R.H., Trevino L., (1987), Message Equivacality, Media Selection, and Manager Performance: Implications for Information Systems, *MIS Quarterly*, Sept. 1987, p. 355
- Daft R. L., Wiginton J., (1979), Language and Organizations, *Academy of Management Review*, Vol. 4, No. 2, p.179
- Dasgupta P., Trust as a Commodity, in Trust: Making and Breaking Cooperative Relations, Gambetta D. (ed.), Blackwell Publishing, New York, p. 47
- Davenport T., Eccles R., Prusak L., (1992); Information Politics, *Sloan Management Review*, Fall 1992, p. 53
- Davenport T., (1994), Saving IT's Soul: Human-Centred Information Management, *Harvard Business Review* 1994, p. 119
- Davenport T., (1997), Working Knowledge: How Organizations Manage what they Know, Harvard Business School Press, MA
- Davenport T., (1998), Enterprise Systems, *Harvard Business Review*, July-August 1998, p.121

Davenport T., Prusak L. (1998), Working Knowledge, Harvard Business School Press, Boston, MA

Davenport T., De Long D., Beers M., (1998), Successful Knowledge Management Projects, *Sloan Management Review*, Winter 1998, p. 43

Demarest M. (1997), Understanding Knowledge Management, *Long Range Planning*, Vol. 30, No. 3, p.374

Denison D. (1996), What is the difference between organizational culture and organizational climate? A native's point of view on a decade of paradigm wars, *Academy of Management Review*, Vol. 21, No. 3, p.619

Dixon T., (1996), Communication, organization and performance, Ablex Publishing, Norwood, NJ

Dogson M., (1993), Learning, Trust, and Technological Collaboration, *Human Relations*, Vol. 46, No.1, p.77

Dougherty, D. (1992), Interpretative barriers to successful product innovation in large firms, *Organization Science*, Vol 3, No. 2, p. 179

Drucker P., (1988), The coming of the new organization, *Harvard Business Review*, January-February 1988, p.28

Duncan R. and Weiss A. (1979), Organisational learning: implications for organisational design, in Cummings, L.L. and Staw, B.M. (eds.), Research in Organizational Behavior, Vol.1, JAI Press, Greenwich CT

- Earl M, Scott I. (1998), Opinion: What Is a Chief Knowledge Officer?, *Sloan Management Review*, Winter 1998, p. 29
- Eisenhardt, K. (1989), Building Theories from Case Study Research, *Academy of Management Review*, Vol.14, No.4 p.532
- Esquibel O., Ning J., Sugg, J., (1990) New Salary System Supports Changing Culture, *HRMagazine*, Vol. 35, No. 10, p.43
- Feldman M., March J., (1981), Information in organisations as signal and symbol, *Administrative Science Quarterly* Vol. 26, p.207-224
- Filipczak B. (1993), Why no one likes your incentive program, *Training* Vol. 30, No. 8 p.19
- Furnham A., Gunter B., (1993), Corporate Assessment, Routledge, New York
- Garvin D., (1997), A Note on Knowledge Management, Harvard Case Study No. 9-398-031, Harvard Business School Publishing, Boston, MA
- Gates B., Business @ the Speed of Thought, Warner Books, New York
- Geertz C., (1973) The interpretation of cultures, Basic Books, New York
- Geraint, John (1998), Share Strength, *People Management*, Vol. 4, No. 16 p. 44
- Ginzberg M. J., (1981), Key Recurrent Issues in the MIS Implementation Process, *MIS Quarterly*, Vol. 5 No.2, p.47
- Hackbarth G., Grover V. (1999), The Knowledge Repository: Organizational Memory Information Systems, *Information Systems Management*, Summer 1999, p. 21

- Hamel G. (1991), Competition for competence and interpartner learning within international alliances, *Strategic Management Journal*, Vol. 12 (Special Issue), p. 83
- Hampden-Turner C. (1990), Corporate Culture: From Vicious to Virtuous Circles, Hutchinson, London
- Handy, C. (1995), Trust in Virtual Organisations, *Harvard Business Review*, May-June 1995, p. 84
- Harrison M., and Shirom A. (1999), Organizational diagnosis and assessment: Bridging theory and practice, Sage, Thousand Oaks
- Henderson J.,(1990) Plugging into Strategic Partnerships: The Critical IS Connection, *Sloan Management Review*, Vol.31, No.3, p.243
- Hofstede G., (1991), Cultures and Organizations, McGraw-Hill, New York
- Hoffman J., (1974), Nothing can be done: Social dimensions of the treatment of stroke patients in a general hospital, *Urban Life and Culture*, Vol. 3, p.50-70
- Johanson J. and Mattson L.G., (1988), Internationalisation in industrial systems – a network approach, In N. Hood and J.E. Vahlne (eds.), Strategies in Global Competition, Croom Helm, London
- Kanter, R. M. (1983); The Change Masters, Simon and Schuster, New York
- Keen P.G.W. (1988) Relationship of Senior Management and the IS Organization, in Transforming the IS Organization, Elam J., Ginzberg M., Keen P.G.W., and Zmud R. (eds.), ICIT Press, Washington, D.C., 1988

Kerr J., Slocum J., (1987), Managing Corporate Culture Through Reward Systems, *Academy of Management Executive*, Vol.1 No.2, p.99

Krippendorff K., (1980), Content analysis, Sage Publications, Beverly Hills

Kohn, A. (1998), Challenging Behaviorist Dogma: Myths About Money and Motivation, Compensation and benefits review, Vol. 30 No. 2 p. 27

Koplyay, T., (1997), Case study: Company A Corporation: Changing Times, University of Ottawa

Lane C., Bachmann R., (1998), Trust Within and Between Organisations, Oxford University Press, Oxford, New York

MacDonald S., (1998), Information for Innovation, Oxford University Press, New York

March J., Simon H., (1958), Organizations, Wiley, New York

Menzel H., Katz E., (1955), Social relations and innovation in the medical profession, Public Opinion Quarterly, Vol. 19, No. 2, p.337

Mintzberg, H., (1973) The Nature of Managerial Work, Harper & Row, New York

Nadler D., Gerstein M., Shaw R., (1992), Organisational Architecture, Designs for changing organizations, Jossey-Bass, San Francisco

Nadler D., Nadler M., (1996), Champions of Change, Jossey-Bass San Francisco

Nadler D., Tushman M., (1997), Competing by Design, Oxford University Press, New York

- Nelson K., Coopridge J., (1996), The Contribution of Shared Knowledge to IS Group Performance, *MIS Quarterly*, Dec. 1996, p. 409
- Nonaka, I., Johansson, J.K. (1985)“Japanese Management: What About the ‘Hard’ Skills?”, *Academy of Management review*, Vol 10, No. 2, p.181
- Nonaka I., (1994), A Dynamic theory of Organizational Knowledge Creation, *Organization Science*, Vol. 5, No. 1, p.14
- Nonaka I., (1995), The knowledge-creating company, Oxford University Press, NY
- Nelson K., Coopridge J.,(1996) The Contribution of Shared Knowledge to IS Group Performance, *MIS Quarterly*, December , p. 409
- O'Reilly C., (1982), Variations in Decision Makers' Use of Information Sources: The Impact of Quality and Accessibility of Information, *Academy of Management Journal*, Vol. 25, No. 4, p. 756
- O'Reilly C., (1989), Corporations, Culture, and Commitment: Motivation and Social Control in Organizations, *California Management Review* Summer 1989, p.9
- O'Reilly C., Chatman J., Caldwell D., (1991), People and organizational culture: A profile comparison approach to assessing person-organization fit, *Academy of Management Journal*, Vol.34, No. 3, p.487
- Patton M. (1990), Qualitative evaluation and research methods, 2nd ed. Sage, Thousand Oaks
- Peters T. (1999), Distinct or Extinct: People Strategies for the New Millennium, radio webcast from: <http://webevents.broadcast.com/wyncom/peters91099/>

- Pfeffer J. (1998), The Human Equation, Harvard Business School Press, Boston
- Pondy L. R. (1978); Leadership is a Language Game, In: Leadership: Where Else Can We Go?, McCall M., Lombardo M. (eds.), Duke University Press, Durham, NC, 1978, p.87
- Quinn J., (1992), Intelligent enterprise: a knowledge and service based paradigm for industry, The Free Press, New York
- Quintas P., Lefrere P., Jones G., (1997), Knowledge Management: a Strategic Agenda, *Long Range Planning*, Vol. 30, No.3, p.385
- Reimus B., (1997), The IT system that couldn't deliver, *Harvard Business Review* May-June p. 33
- Rempel J., Holmes J., Zanna M., (1985), Trust in close relationships, *Journal of Personality and Social Psychology*, Vol.49, No. 1, p.95
- Rich J.T., (1999), The Growth imperative, *Journal of Business Strategy*, March/April 1999, p.27
- Robbins S., (1996), Organizational behavior: concepts, controversies, and applications, 7th ed. Prentice Hall, New Jersey
- Rockart J., Earl M., Ross J., (1996), Eight Imperatives for the New IT Organization, *Sloan Management Review*, Vol. 38 No. 3 p.43
- Rodwell I. Humphries J., (1998), Sharing Samson's Hair: The legal face of Knowledge Management, *Managing Information*, Vol. 5, No. 7, p. 31

- Rotter J. B., (1980), Interpersonal Trust, Trustworthiness and Gullibility, *American Psychologist*, Vol. 35, p.1-7
- Rousseau D., (1990) Assessing organizational culture: the case for multiple methods, In B. Schneider (Ed.), Organizational climate and culture, Jossey-Bass, San Francisco
- Sackmann S. (1991), Cultural knowledge in organizations : exploring the collective mind, SAGE Publications Inc., Newbury Park CA
- Sackmann S. (1992), Culture and Subcultures: An analysis of Organisational Knowledge, *Administrative Science Quarterly*, Vol. 37, p.140
- Schein E., (1985), Organizational Culture and Leadership, Jossey-Bass, San Francisco
- Schein E. (1990), Organizational Culture, *American Psychologist*, Vol. 45, No. 2, p. 109
- Schein E. (1996) Culture: The missing Concept in Organization Studies, *Administration Science Quarterly* Vol. 41, No. 2, p. 229
- Schultz, M. (1994), On studying organizational cultures: diagnosis and understanding, De Gruyter, New York
- Sherif M.(1966), In common predicament: Social Psychology of Intergroup Conflict and Cooperation, Houghten Mifflin Company, Boston
- Sherif M and Sherif C.W. (1953), Groups in Harmony and Tension, Harper and Brothers, New York
- Sitkin S., Roth N. L. (1993), Exploring the Limited Effectiveness of Legalistic 'Remedies' for Trust/Distrust, *Organization Science*, Vol.4, No.3, p.367

Stata R., (1989), Organizational learning – the key to management innovation, *Sloan Management Review*, Vol. 17, No. 1, p.63

Steinfeld C. W., Fulk J., (1986) task demands and managers' use of communication media: An information processing view, The Academy of Management Organisation Communication Division, Chicago, IL

Strauss A. (1987), Qualitative analysis for social scientists, Cambridge University Press, Cambridge

Strauss A., Corbin J., (1990), Basics of Qualitative Research, Sage, Newbury Park

Szamosi L., (1998), A New Perspective on the Change Process: Developing a Model of Revolutionary Change and a Measure of Organizational Support for Change, Carleton University, Ph.D. proposal

Tenkasi R., Boland R., (1996), Exploring knowledge diversity in knowledge intensive firms: a new role for information systems, *Journal of Organizational Change Management*, Vol. 9, No. 1 p. 79

Thong J., Yap C., Raman K., (1996), Top Management Support, External Expertise and Information Systems Implementation in Small Businesses, *Information Systems Research*, Vol.7, No.2, p.248

Trevino L., Lengel R., Daft R., (1987), Media Symbolism, Media Richness, and Media Choice in Organizations, *Communication Research*, Vol.14, No.5 p.553

Tushman M., O'Reilly C. (1997), Winning through innovation: a practical guide to leading organizational change and renewal, Harvard Business School Press, Boston, MA

Van Maanen J. (1978), People processing: strategies of organisational socialisation, *Organisational Dynamics*, No. 7, p.18-33

Van Maanen J., Dabbs J., Faulkner R., (1982), Varieties of Qualitative Research, Sage, Beverly Hills

Von Krogh G. (1998), Care in Knowledge Creation, *California Management Review*, Vol. 40, No.3, p. 133

Wah L., (1999), Behind the Buzz, *Management Review*, April 1999, p.17

Williams A., Dobson P., and Walters M., (1989), Changing Culture: New Organizational Approaches, IPA London

Xenikou A., Furnham A., (1996), A Correlational and Factor Analytic Study of Four Questionnaire Measures of Organizational Culture, *Human Relations*, Vol. 49, No. 3

Yin R., (1994); Case Study Research, 2nd ed., Sage, Thousand Oaks

Zand D. (1971), Trust and Managerial Problem Solving, *Administrative Science Quarterly*, 1971, p. 229

Zeleny, M (1989), Knowledge as a New Form of capital, *Human Systems Management*, Vol. 8 No. 1, p.45

Zucker L. (1986), Production of Trust: Institutional Sources of Economic Structure, 1840-1920, in Research in Organizational Behaviour, Staw B., Cummings L.L. (1986), p. 53-111

Appendix I

Communication Survey

Dear.....,

We would like to thank you for agreeing to participate in this study of knowledge sharing. Knowledge sharing, a practice where people working together exchange their valuable information with each other is not a new phenomenon. Little is known, however, about how high technology companies can best support the sharing of knowledge.

We are presently conducting an exploratory study on aspects of organisational culture that affect knowledge sharing. By organisational culture we mean the values and beliefs that are really important in the work environment, in this case within Company A. This research is being undertaken for a thesis in the Master of Management Studies Program in Carleton University's School of Business, under the supervision of Dr. Linda Duxbury, in co-operation with Company A.

The research consists of two steps. The communication survey, that is in front of you, and personal interviews. In the first step we would like you to fill out the survey about communication in the context of knowledge sharing. In order to keep the interview as short as possible, I would appreciate it if you would fill out the survey about your communication habits and give it back to me at the interview.

The second step will be interviews. During the interview I am going to be focussing on aspects of organisational culture. **Please be assured that your responses will be held in confidence and only summary results from the entire study will be presented in the final report.**

I would also like to mention that at the beginning of the interview, I will be requesting your permission to tape the interview in order to make it easier for me to code the results. Please be assured that only the researchers will have access to the tape and your responses will be kept strictly confidential. **Nowhere on the tape will you be identified by name. The tape will be destroyed after the results have been coded. Also, you are not obligated to respond to any question that you do not feel comfortable with.**

If you have any questions, please do not hesitate to contact me. My co-ordinates are:

Phone: 520-2600 ext.1818

Email: hggruber@business.carleton.ca

I look forward to meeting with you.

Sincerely

Hans-Georg Gruber

Graduate Student, Master of Management Studies

1. On average, how many hours are in your workday? _____ hours
2. Approximately what percent of this time was spent communicating with others _____ percent
3. Approximately what percentage of the time communicated did you spend communicating with the following people: (Should sum up to 100%):

People communicated with	Percentage of communication time
Colleagues in same department	
Colleagues in other department	
Supervisor	
Subordinates in same department	
Subordinates in other department	
Clients	
Others	
Please specify	
Total percentage	100 %

4. Please think about an average day and who you communicated with. Please indicate the percentage of the time you used each of the communication channels to communicate with each of these individuals / groups.

People communicated with	Channel used (% of time you use that channel for that group of people)						
	Communication channel						Groupware please specify
	Face-to-face	meetings	email	fax	phone	Memo	intranet
Colleagues in same department							
Colleagues in other department							
Supervisor							
Subordinates in same department							
Subordinates in other department							
Clients							
Others (please specify)							

What communication channels are available to you ?