Master Thesis in Informatics

A portal implementation for information sharing
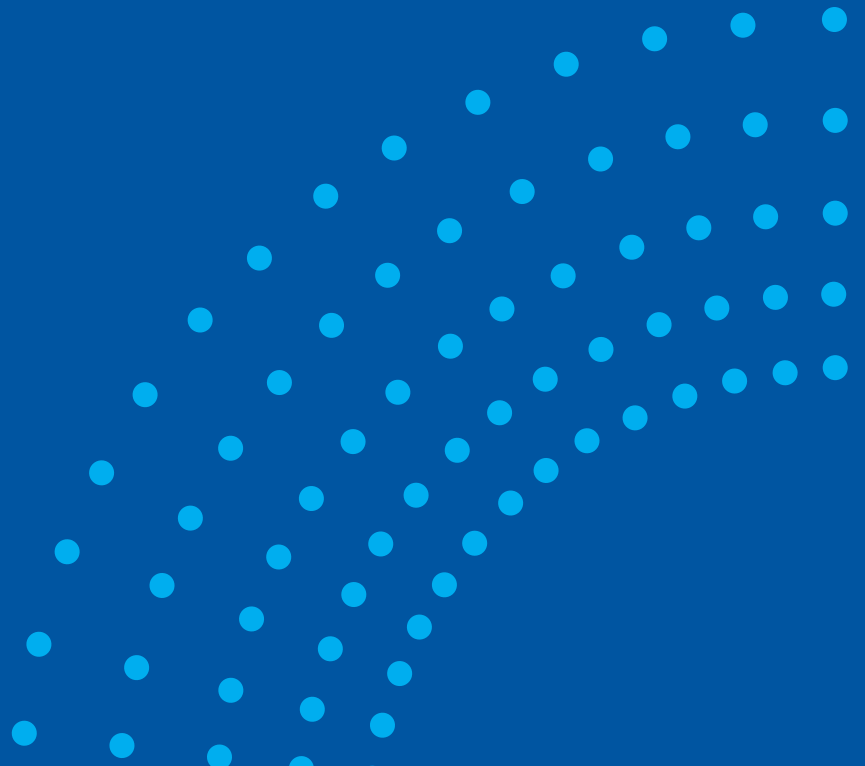
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Business Technology

A portal implementation for information sharing:

A case study in a pharmaceutical company

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SUMMARY

An organization's ability to create new knowledge is today regarded as a primary source of competitive advantage and will increase even more in the future. Therefore, an active support of organizations knowledge creation should be prioritised. The existence of "islands of information" makes it harder to efficiently utilize collaboration and the ability to share information. The purpose of this study is to investigate how a fragmented information environment affects information sharing among users and how information sharing between employees can be facilitated through the use of an intranet portal. Our study was performed in an R&D organization where knowledge is generated at a high pace and where collaboration and information sharing, across boundaries as well as on an internal level, are seen as essential components for organizational success. Our study shows that information is primarily shared through informal networks. One conclusion is that informal networks, at least in a short-term perspective, will still be the prominent way of sharing information after an implementation of a new portal. However, important benefits with the portal are that it can bridge distances between geographically dispersed project members. Moreover, effective ways of searching and navigating will promote information sharing because information will be easier to find for users. Also, virtual collaboration tools will enable users to exchange, share and discuss information and knowledge.

Keywords: Information Sharing, Portal, Collaboration, Navigation, Searching, Personalization

This report is written in English

Acknowledgement

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1 Introduction

In this chapter we aim to introduce the background to our problem area and the purpose of our study. The expected result of the study will also be described as well as to whom the study will be addressed to and delimitations made in the study.

1.1 Background

The shift in society towards the new knowledge-based economy, which is driven by the dissemination of information, best-practice and shared insight rather than the production of tangible manufactured goods is attested in many reports and books (Al-Hawamdeh 2002; Detlor, 2004a; Quinn, 1993). Statements such as that the basic economic resource no longer is capital, natural resources or labour, but is and will be knowledge is also brought forward by several authors (Corbitt, 2004; Detlor, 2004a). The information-based society has arrived and the organizations that will succeed in the global information environment are those that can identity, value, create and evolve their information assets (Corbitt, 2004; Davenport, 1997).

Despite more than forty years of the *information revolution* in businesses, most mangers still claim that they cannot get the information they need to run their own units or functions (Davenport et al., 1992). As people's jobs become more and more defined by the unique information they hold, Davenport et al. (1992) argues that they will be less likely to share information; people view it as a source of power. An organization's ability to create new knowledge is today regarded as a primary source of competitive advantage and will increase even more in the future. Therefore, an active support of organizations knowledge creation should be prioritised.

In contrast to most organization's desire to centrally control their information environments, it seems that new knowledge emerges and thrives on serendipitous mixing that occurs in more uncontrolled bottom-up settings (Stenmark, 2003). Organizations with the objective to implement knowledge management must grabble with issues such as strategy, technology, organizational culture and knowledge organization. Companies worldwide, in the private sector and public sector, have both shown great interest in knowledge management despite these issues (Al-Hawamdeh, 2002). Judging from the large amount of money expected to be committed for knowledge management in the next few years makes it a very interesting research area. Research indicates that the inability to quickly and efficiently find information will lead to that companies listed in Fortune 500 will lose approximately $ 30 billion by next year (Verity, 2004).

Unfortunately, in many organizations multiple intranets and groupware applications have been deployed in isolation, which leads to even more silos of information in the corporation (Fenner & Watson, 2000). In order to promote gathering, sharing, and dissemination of information throughout the organizations: portals are used. Portals are for many seen as a natural evolution of intranets and groupware solutions into a common information infrastructure (Detlor, 2000; Fenner & Watson, 2000). Often, traditional data-driven approaches to portal and intranet design ignore the information need and

practice of users. The resulting effect of this is that a portal can suffer from usability problems, mainly such as navigation and inappropriate display of information that can prevent or inhibit the use of these systems. Some of the key features with a portal are that it must be accessible and easy-to-use for all users. With the use of customisation a portal can become a valuable resource for employees (Fenner & Watson, 2000; Moore, 2000). On the contrary to the Internet, the portal accrues to the largest companies and the larger the organization is; the greater the value will be delivered (Bankier & Schatsky, 2002). This is something that to this date has to be proved.

1.2 Problem area

Nowadays, many organizations have problems with "islands of information" i.e. information spread out on different dispersed systems and functional areas. This means that it can be unruly for users to collect the "right" information in an efficient manner. Therefore, it becomes hard for organizations to unite information that is diversified over different departments and functions. The result can be that it becomes harder to access information between functional areas, within the organization, and the process of gathering and distributing information gets too complex. Consequently, organization cannot fully use their capacity of cross-functional information sharing (Scheepers & Damsgaard, 1997).

The existence of "islands of information" makes it harder to efficiently utilize collaboration and the ability to share information. Collaboration often takes place within organization's functional areas, instead of involving the whole organization in the process; the effect can be a confinement of the ability to utilize collaboration and information sharing (Scheepers & Damsgaard, 1997).

According to Duane & Finnegan (2000), organizations want to break these physical boundaries and extend their ability to collaborate within their own enterprise and with their partners. Nowadays, there are high demands to render new solutions, which make it more important to put collaboration and information sharing into a wider and more efficient context.

In the present situation, enterprises need to collect expertise from different sources. Successful initiatives have to consist of an effective synergy between different functional departments. The synergy effect will lead to that the interaction between different functional departments will create new knowledge (Ding & Ravichandran, 2000). Hence, inter-connectivity between different functional departments involves problems. A problem that might occur, according to Ding & Ravichandran (2000), is the issue of integrating and sharing knowledge across inter-departmental boundaries. This is often difficult because knowledge is bound to specific functional domains, which makes it hard for users the retrieve knowledge that is generated by other departments than their own.

1.3 Research questions and purpose

With the issues described in the problem area in mind i.e. where fragmented information environments are considered to be something that knowledge intensive corporations suffer from. We are going to study the fragmentation phenomena in an organization

where knowledge is generated at a high pace and where collaboration and information sharing, across boundaries as well as on a internal level, are seen as essential components for the organization's success. Therefore, it is of high interest for us to study a pharmaceutical company, which led to that we studied AstraZeneca R&D Mölndal. We are interested in how a fragmented information environment relates to information sharing among users and how information sharing between employees can be facilitated. Hence, the purpose of our study is to gain an understanding for what consequences a transition from a fragmented intranet environment to a uniform platform could have on users' ability to share information. We will also create guidelines that could be of benefit for organizations in such a transition.

Within the context of AstraZeneca R&D Mölndal and with the respect to the purpose the following research question was founded:

How will a transition from a fragmented information environment to a new uniform portal affect the ability to share information?

With respect to the research question the following aspects will studied:

- The users' current information needs and ability to gather that information.
- The users' ability to collaborate and network within and across projects, R&D sites, and functions on an individual level.

1.4   Delimitation

In this paper we will demarcate from the most technical questions surrounding a portal implementation. This means that we will not go in-depth on technical issues concerning search, navigation etc; we will just concentrate on how the technical aspects affect users ability to use them in their work tasks i.e. the users perspective. We will not thoroughly describe how data is stored or other technical descriptions of how portals are constructed. Due to lack of time we will not in detail describe and analyse the result of the previous made survey. We will only give a brief overview over what results that we have found interesting. The empirical study concerns interviews from AstraZeneca's Swedish R&D site in Mölndal, therefore we delimitate us from describing opinions stated by employees on any other of AstraZeneca's sites. As a result, the effect could be that our empirical study does not reflect the whole truth about what is seen as problematic at AstraZeneca as a whole. It should also be expressed that the portal did not, when this was written, exist. During the end of our study the first release of the portal was delivered. This meant that we could not study real alterations of information sharing within AstraZeneca, we only studied premises for change on users' ability to share information in the new portal.

1.5   Conception

This is some of the key conceptions that occur in this thesis.

Collaboration: "*The process of working together on a common task or process" (Biuk-Aghai, 2003)*

Information*: "The meaning of information is user-aimed. Information is the processing result of data, which could provide value to user. Information has the following three characteristics: inter-transformation with data, storing and processing in data format, and transfer among users." (Lei et al., 2000)*

Information architecture: "*The combination of organisation, labelling and navigation schemes within an information system." (White, 2004)*

Information culture: "*Refers to the degree to which information is readily shared, valued, and filtered across the company." (Detlor, 2004a, p. 92)*

Informal networks: "*Social relationships between individuals in an organization. Networking considers interaction with a range of people when performing work tasks. Relations are created informally, beyond the scope of the organizations formal structure." (Teigland, 2003)*

Information politics: "*Refers to the human struggle over management of information, in this case the management of portal content and application." (Detlor, 2004a, p. 92)*

Information sharing: *"Refers to the ability to find and share relevant information between participants in a project." (Gauvin et al., 2004)*

Intranet: "*A set of applications built on an internet-enabled infrastructure meant for internal use only by employees of a single organization."*(Detlor, 2000)

Knowledge: "*A state of mind from different individuals. The state of mind expands through inputs received from the individuals' environment. Knowledge also involves the ability to interpret and use information gathered." (Benbya et al., 2004).*

Knowledge management: "*Knowledge management refers to the methods and tools for capturing, storing, organizing, and making accessible knowledge and expertise within and across communities (Mack et al., 2001). The core knowledge management activities encompass assessing, changing and improving human individual skills and/or behavior. It is a complex set of dynamic skills and know-how that is constantly changing." (Al-Hawamdeh, 2002)*

Portal: There are several definitions of a portal: **"***A general definition of a portal is an application that enables companies to unlock internally and externally stored information, and provide users with a single gateway to personalized information needs to make informed business decisions."(Shilakes & Tylman, 1998)*

"A *portal initiative that makes it possible for organizations to provide rich and complex shared information workspace for generation, exchange, and use of knowledge (Benbya et al., 2004). Portals differ from intranets in that a portal is primary used to provide a transparent directory of information that is already available elsewhere, not act as a separate source of information itself." (Plumtree, 1999)*

The definition of a portal are through scientific papers described with different names, but with the same meaning of the concept portal e.g. knowledge portal, corporate portal, enterprise portal. Hereafter we will only use portal when describing it, instead of using any of these other suggested definitions.

Portlet: *"The individual portal components (representing different information sources) which are rendered together to a portal webpage are called portlets." (Priebe & Pernul, 2003)*

1.6　Disposition

Chapter 1: The background of the paper, problem area and our research question is described. The chapter continues with describing our delimitation and recurring concepts.

Chapter 2: Gives an in-depth description of the methods that have been used when conducting the empirical study, as well as how data was collected for both the empirical and the theoretical contribution. The chapter ends with describing how our analysis was conducted and how our knowledge product was evaluated.

Chapter 3: Describes a Knowledge Portal Framework that constitutes the foundation to our thesis. The chapter continues with defining vital concepts within a portal: information sharing and collaboration. Thereafter, a portal in general is described followed by techniques to facilitate adoption of a portal among users. The chapter ends with describing the information environment, information culture and different modes of information politics that can occur in an organization.

Chapter 4: Provides a lengthy summary over what was found interesting when it came to respondents' opinions about the currently used systems and the results from the survey. The chapter contains opinions from two different functions and the illuminated questions were aligned to match the research question.

Chapter 5: This chapter discusses the results from the empirical study. The chapter draw parallels between the theoretical and the empirical contribution and provides the reader with our own thoughts. Also, implications for management are brought forward for organization in the same situation and further research.

Chapter 6: Concluding remarks on what were stated in the discussion chapter.

2 Method

This part describes the process of our work. The purpose of this chapter is to describe the type of knowledge that could be gained in this paper, which scientific approach that we have used, the research strategy that we used when we conducted our study, the data collection process and the analysing method of this data.

2.1 Scientific approach

The scientific approach consists of two basic lines of actions; qualitative and quantitative methods. Qualitative methods concerns, according to Easterby-Smith et al. (2002), in-depth interviewing while quantitative methods concerns surveys and interviews on a more superficial level. Instead of in-depth interviews, surveys are used to cover up a wide spectrum of results. Other authors, Holme & Solvang (1997), describe qualitative methods as finding characteristics of the respondents and the life situation of their organization. The importance of information in qualitative methods is very dependent on the information source i.e. the respondent. Information is often gathered during interviews in a way that are very alike regular and common conversations.

In our study, we used a qualitative approach. The qualitative contribution was follow-up interviews in order to explore more in-depth why respondents answered in certain ways, so a more fruitful analysis could be given.

2.2 Research strategy

Our aim was to primarily gain new knowledge and draw conclusions based on an analysis of empirical data. The explanatory knowledge was produced through the use of interviews with employees in AstraZeneca R&D Mölndal, where our case study was performed. The empirical contribution formed and generated our results. Therefore, we primary used an inductive research strategy when conducting our study. With an inductive research strategy, the theoretical contribution is the result of the researcher's effort. As a result, the meaning of an induction process is described as that the researchers draw generalized conclusions on the basis of the concluded observations. An inductive strategy is often interconnected with the use of a qualitative approach (Bryman, 2002).

2.3 Data collection process

This section describes the procedure of how data has been collected. The data collection process consists of sampling, collection and adaptation. Many different methods can be used when collecting data, the main difference is the distinction between qualitative and quantitative research. Our study consists mainly of qualitative data. The qualitative research does not consist of probability principles. It covers a large number of sampling techniques such as convenient sampling, snowball sampling and quota sampling (Bryman, 2002). We have used snowball sampling due to the fact that one interview lead to another.

2.3.1 The purpose of the survey

The information and knowledge management survey was conducted during the summer of 2004. The survey (IM&KM survey 2004) was designed and carried out by AstraZeneca in mid August and consisted of a 48 percent response rate; including 519 questionnaires. The sample consisted of a random selection of 1300 managers and researchers employed at eight R&D sites in three different countries, representing 10 percent of AstraZeneca's R&D employees. The participation was voluntary for all invited employees, and confidentiality of responses was assured. A summary of the results from the survey were given to us after it had been made, we were not involved in this process.

The initial purpose of the survey that was brought to us was to establish key concepts regarding the working environment, i.e., IT and infrastructure, information sharing, networks and learning culture. Results from the survey, together with a second survey planned during the autumn 2005, will enable opportunities for analysing effects and outcomes of the implementation and use of the new intranet infrastructure.

2.3.2 The purpose of the interviews

As a part of our research we have conducted interviews with users of the current intranet platform. The questions mainly focused on how users view this platform; the advantages and disadvantages that they have experienced when using it. These interview questions were influenced by the questions asked in the IM&KM survey 2004 (Appendix 1: Interview guide). The interviews were conducted during November and December 2004 and were approximately one hour long. Eight individuals were interviewed, seven within the same global project, and one outside this project. The objective was to interview different users from Discovery and Development (see chapter 4.1 for description). In the end five were selected from Development and three were selected from Discovery. The one outside the project belonged to Development and was interviewed in order to see if the situation inside project was unique or not. Table 1 describes profession and departmental belonging of the respondents.

Table 1. The respondents and their organizational belonging

	Profession	Department	Division
1.	Team leader	Clinical information management	Development
2.	Project programming leader	Clinical information management	Development
3.	Team leader	Integrative Pharmacology	Discovery
4.	Associate Director	Molecular Pharmacology	Discovery
5.	Clinical Project Director	Clinical Project Management	Development
6.	Global Project Management Director	Medicine Key Brand Team	Development
7.	Pre-clinical manager	Integrative Pharmacology	Discovery
8.	Secretary	Medical Informatics	Development

The interviews were the cornerstone in our study. During the data collection process we conducted interviews that were semi-structured; we had several questions that were prepared in advance to start from. The questions were complemented with different follow-up questions depending on the answers from the respondents. In order for the respondents to answer the questions freely there were no specific answers for the respondents to choose from during the interviews. We solely conducted the interviews

with users at the organization. The interviews were carefully questioned as we tried to avoid revealing our own beliefs and perceptions: we tried not to affect the respondent's answers. The interviews were conducted as an everyday conversation, which is according to Holme & Solvang (1997) very important. We also believe that this was very important in order to make to respondent comfortable and confident with the situation and us.

The course of action when conducting the interviews was that several users were asked if they wanted to participate in an interview; eight out of twelve users accepted. After scheduling a meeting for the interview the respondent were asked if we could record the interview or not: none of the respondents declined. This was considered as the best option for us, we wanted to concentrate completely on the respondent and not miss any important information. We recorded the interview with a laptop and the interviews were transcribed by us.

Source studies were conduced through reading literature within the research area. The literature was gathered through different media such as printed sources, publications and electronic documents.

2.4   Analysis method

When analysing, the researcher distinguish the parts of a general picture and examine the connections between them and eventually end up with the whole picture. Analysing data is about categorizing the collected data in order to describe what has been concluded. The collected data is processed in order to make it more perspicuous. An analysis is a kind of simplification that contributes to the clarity of the collected data. The problem area is the catalyst of the analysis, which is of help when searching for data of relevance for the study. If the study is not purely descriptive the researcher should try to reach an understanding of, or an explanation for, the discovered pattern (Andersen, 1998). When analysing data the objective is also to locate causes for a phenomena and to find predictions to why it occurs (Holme & Solvang, 1997). There are many ways to do this; we will present some of them here.

When analysing quantitative data, the conception and the categorization is done before the analysis and the interpretation has been conducted. The conceptions must be clear in advance due to the fact that they are vital for designing the form of the survey. This is not the case when analysing qualitative data. These processes are more often woven into each other and they occur during the whole research process, even during the collection of data. An interpretation is done at the same time as the data collection process. Ideas are tested, modified, more data is collected and the process is done recursively. This means that the material in a qualitative study can shift form and content during the time the research is conducted. When conducting a qualitative research study, it concerns being creative and being able to find a conformity and order between the collected data. This is the opposite of quantitative research, where most of the brainwork is done before the data collection (Andersen, 1998).

During our qualitative approach, the understanding for different situations and conceptions from persons were analysed together with the theoretical study. This led to

an explainable knowledge and, through this, normative knowledge was created. The large part of the analysis was done after all data were collected.

3 Theoretical framework

The following chapter consists of the central theory of our study such as framework, information sharing, portals, users, information environment and information design. The purpose is to provide a deeper understanding of the concept and the problem area.

3.1 Framework

The Knowledge Portal Framework that Detlor (2004a) presents in his book brings forward three shaping entities of knowledge portals. These impacts on organizational knowledge creation, distribution and use, users' information environment and the portal's information design. The entities are illustrated in figure 1 below.
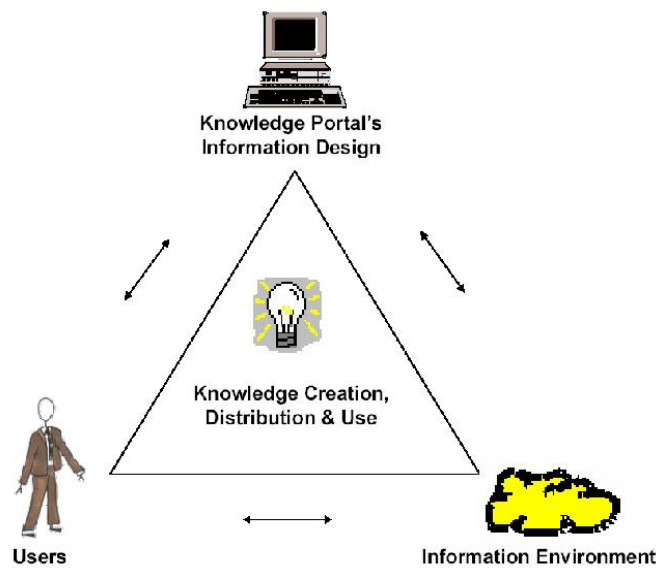
Figure 1. The knowledge portal framework (Detlor, 2004a, p 38)

The three entities user, information environment, and information design influences and are influenced by each other, they do not work in isolation. The relationship is shown in figure 1 and it suggests that these entities work in tandem to determine the extent to which a portal utilizes knowledge creation, distribution and use. Detlor's (2004a) Knowledge Portal Framework illustrates that many factors can shape and affect the development and use of portals (portals are more thoroughly explained in sub-chapter 3.2.1) in organizations. Detlor (2004a) argue that the functions and features that could be offered within a portal design can influence the information behaviours of users and potentially alter the environment. Similarly, functional roles of user influence the type of services that are offered with a knowledge portal design. Also, the perceptions of users, motivation and personal information behaviour can help shape larger organizational attitudes toward the use and sharing of information. Likewise, the information environment of the firm can impact the user adoption and directly influence the design and functionality within a portal's information design.

Viewing it from the *users* perspective involves developing a clear understanding of whom the major sets of users are in terms of their information needs and preferences, their work-related problem situation and how they prefer to get information displayed and presented. The *environmental* view contains interdependent social and cultural subsystems that influence the creation of flow and use of information. This can include an organization's information management, information culture, information politics etc. The *interface* perspective concerns the need to create value-added processes and extend the value of information to the organization and its users (Detlor, 2004a).

3.1.1 Information sharing

Within decision-making, there is an essential need to handle information so that decisions can be performed and be accurate. This consists of acquiring, sharing and processing the organizational information (Miranda & Saunders, 2003). Without the use of information sharing in organizations users would be forced to reinvent the wheel every time they run into a problem, even if co-workers within the organization would have encountered the same obstacle (Galletta et al., 2003).

Throughout literature the issue of describing information sharing, with the use of collaborative electronic media, has been discussed by authors (Jarvenpaa & Staples, 2000; Miranda & Saunders, 2003). Acquired through reviewed literature, there are several different possibilities and advantages when using this technique. The most prominent factors influencing communication between users are friendship and user contacts. It is more likely that information sharing exists between individuals that hold stronger bonds to each other (Kolekofski & Heminger, 2003). Consequently, electronic media does not only contain advantages, some drawbacks with the use of electronic media can be summarized from Miranda & Saunders (2003) article, such as reciprocity issues. When sharing information, an interaction and reciprocation has to be done between the parts involved in the process. Miranda & Saunders (2003) states that:

> "Individuals must be able to interact and seek feedback to reconcile their position with others based on differences in experience, values, and even facets of individuals' cognitions." (p. 91)

Other issues that may be a concern when it comes to using information technology is the matter of information overload. Information overload can be a case of concern for users when anonymity is used in discussion boards etc. According to Miranda & Saunders (2003) the usage of anonymity within collaboration media is a way to promote information sharing. When anonymity is used, users can share information and opinions with their co-workers that otherwise had been uncomfortable to share. Therefore, the amount of information shared could increase drastically. Thus, the use of electronic media encourages information sharing and the breadth of the discussion made by users.

Why is reciprocation of information often seen as a hinder or a threat? The question can involve many different factors to why users in an organization do not exchange information with each other. Often, users are expected to get something in return when they share their own produced material. Gains can be that the sender of the information receives access to new valuable information, new sources of expertise, personal gains or status. Frequently, individuals who seek information act in a self-interest manner

(McLure Wasko & Faraj, 2000). McLure Wasko & Faraj (2000) constituted a survey where they found out that individuals only tend to access discussion boards and newsgroups when they were in need of information that matched their own self-interest. Otherwise, participants tended to be "hidden in the background" and did not take an active part in discussion boards or when it came to contribute with their own information and knowledge. The reason given for their minimal participation was stated as being a time matter.

Ensign & Hébert (2004) strengthens the previous demonstrated example of self-interest. In their article they show that sources of information i.e. individuals that possess vital information are not likely to share their information, unless they get something in return. The return, in this case, can be indebtedness from other users and can thereby give the source of the information new future sources that he or she can utilize.

Ensign & Hébert (2004) also urge that reputation is a fundamental cornerstone when considering collaboration and information sharing. Individuals who possess strong social ties are, according to Ensign & Hébert (2004), more willing to collaborate and share information, while individuals that have weak social ties are more unwilling to share scientific know-how. Thus, the issue of sharing information does not only involve personal gains contra organizational gains. Galletta et al. (2002) states that the issue for individuals to decide, whether to share or not, lays in how they value the specific knowledge or information. If the information or knowledge has a high personal value, it is more likely that they do not share it.

Jarvenpaa & Staples (2000) identified, through their research that it is unlikely that collaborative media will be used by employees who identified information as an organizational belonging. Instead, the authors suggest that people share information and knowledge, more on a regular basis, if the information is believed to be own by them selves, which gives the employee a sense of satisfaction and a personal gain when sharing it. Jarvenpaa & Staples (2000) suggest that in order for employees to use collaborative media within an organization, the collaborative media has to match the users' needs. Collaborative media has to allow a high level of interdependence for users i.e. tasks shared between users who works closely together. Higher levels of interdependent activities result in higher usage of collaborative media. Jarvenpaa & Staples (2000) also hypotheses that if users feel strong bonds to each other their interest to share information would increase, in other words stronger bonds between users would increase the overall usage of the collaborative media.

One of the major threats when it comes to sharing information within a firm is, according to Szulanski (1996), lack of motivation. Lack of motivation can lead to many different hinders. Firstly, users often feel that ownership of crucial information is lost when it is shared. Secondly, users are often reluctant to share information because that the information they posses can involve privileges that they loose if the information is not in their possession. While possessing it, it may generate a feeling of superiority over their co-workers i.e. the users possess vital information that co-workers do not have access to. These factors inhibits information sharing and can result in something that Staples &

Jarvenpaa (2000) calls information pathologies e.g. preservation of information from co-workers, making information clandestine etc.

How can organizations facilitate information sharing between users? According to Staples & Jarvenpaa (2000) motivation of information sharing can be constituted through three different methods:

- *Motivating Sharing via Cultural Norms:* Promotion of information sharing among users through organizational and information cultures. Staples & Jarvenpaa (2000) states that information sharing can be promoted through cultural norms within the organization, on an organizational basis as well as on a departmental basis.
- *Motivating Sharing via Individually-held Attitudes and Beliefs:* Usage of independent actors to promote information sharing on an individual basis within the firm. Staples & Jarvenpaa (2000) advocates that these actors should embrace beliefs and attitudes that promote users to share information within the organization.
- *Motivating Sharing by Needing to Use Technology that Fits the Task:* Supply users with relevant information technology so that they feel that information sharing is necessary within their work tasks and that the information technology matches the users needs.

3.1.2 Collaboration

Trough recent literature, enquiries have been brought up considering the relation between co-operation and collaboration. Langton et al. (2003) bring up different interpretations of how collaboration contra co-operation can be regarded. Collaboration can be seen as an important component, on an individual basis, that is needed so that co-operation can occur. Moreover, it is suggested that collaboration only can exist and prosper in organizations where co-operation already exist.

The use of collaborative tools and the increasing interest in sharing and cooperating with different functional areas within organizations has under last several years opened the doors for extensive collaboration activities (Song et al., 1997). Often, organizations have to handle a large amount of different internal sites and organizations have to cope with problems such as inter-connectivity between geographically dispersed teams (Coleman, 1997). Other factors that make collaboration indispensable for companies are in fact the rapid change of technology and the pressure from the global market (Olson et al., 2001).

Although, there are several different ways of conducting collaboration, in that sense that it can be established in different ways. Authors often differ between two concepts; collaboration and virtual collaboration (Biuk-Aghai, 2003; Peters, 2003). Biuk-Aghai's (2003) definition of collaboration is that collaboration is done trough a face-to-face contact. On the contrary, virtual collaboration has in general the same definition, but virtual collaboration is constituted without any use of face-to-face contact. Instead, virtual collaboration uses Internet Technology to manage and control the collaboration techniques (Townsend et al., 1998). Also, virtual collaboration concerns dispersed individuals in projects (Chevrier, 2003). Townsend et al. (1998) also advocates that

members, in virtual collaboration groups, use non-face-to-face techniques to synchronize work and to share the same purpose and goals. The use of Internet media for collaboration activities should not be seen as the "liberator" of all collaboration problems within organizations. Rather, Internet Technology should be seen as an enabler of communication between dispersed groups, but therefore not the solution (Igbaria, 1999). A difference between non-virtual teams and virtual teams is that virtual teams can enhance flexibility and be more dynamically adaptable. The reason for this is because groups that constitute virtual collaboration often consist of members from different functional belongings and cultures (Peters, 2003).

Igbaria (1999) and Siviter et al.(1997) uses a model when describing different collaboration modes that organizations can utilize.

Table 2. Model of collaboration modes (Igbaria, 1999, p. 67; Siviter et al. (1997, p. 77)

	Same place	*Different place*
Same time (synchronous)	e.g., face-to-face meetings	e.g., audio-visual conferencing
Different time (asynchronous)	e.g., sharing databases	e.g., message-based collaboration

The model (table 2) shows differences between collaboration and virtual collaboration. As the model illustrate, the need for virtual collaboration, if the organization dispersed throughout the world, is inevitable. According to the model, regular collaboration, that Biuk-Aghai (2003) states as face-to-face contact, can only be taken into consideration when the organizational units is synchronous and when they are situated at the same place. While asynchronous activities demands a need for virtual collaboration and sharing of information through databases etc.

3.1.3   Collaboration across boundaries

Pressures from market and the ever-growing need to share information have made it more important for organizations to collaborate within their own company. The matter of re-organizing in order to cope and to follow market trends has had the effect that organizations must evolve agility (Biuk-Aghai, 2003). According to Biuk-Aghai (2003) an agile company is a company that change their corporation and adapt to new organizational structures. Therefore, new ways of collaboration with different functions and units of the organization has evolved; one way is the usage of cross-functional collaboration teams (Biuk-Aghai, 2003; Powell et al., 2004).

Though the use of cross-functional collaboration involves different problems:

- *Personality barriers:* Refers to cultural barriers within an organization. Personality differences could form a hinder for mutual understanding between collaborating groups (Griffin & Hauser, 1996).
- *Divergent cultural worldviews:* Differences in worldviews and languages can be the result of different training and background between groups and can constitute a hinder for groups working towards mutual goals and solutions (Griffin & Hauser, 1996). These factors often result in that new products arrive on the market too late or that the costs for projects increase (Leenders & Wierenga., 2002). In order to succeed, collaborators need to understand and appreciate other user's worldviews (Griffin & Hauser, 1996).
- *Physical barriers:* Refers to physical distances between collaborators within projects. Users in projects are often dispersed on different sites throughout the world. Separation decreases the chance for involved users to meet face-to-face that could make informal networking difficult (Griffin & Hauser, 1996).

How should organizations co-locate groups in an organization with dispersed knowledge sources? Kahn (1996) calls the term of joining dispersed groups together as interdepartmental integration. Interdepartmental interaction can be divided into two different philosophies:

- *Interaction philosophy:* Organizations operating with an interaction philosophy will attain that departments within the company should interact to the highest degree. The philosophy encourages managers to hold meetings between departments so that transactions between units can be facilitated. The interacting divisions in an organization are seen as independent and they compete for the organizations resources. A problem with interacting is that users do not have time to do anything else than go to meetings (Kahn, 1996).
- *Collaboration philosophy:* Involves continuous relationship between departments' not only transactions, as in the interaction philosophy. Departments within the organization often share common goals, shared visions and an emphasis on management of relationships through informal structures. Departments are considered to be interdependent and therefore departments are more open-minded and are encouraged to achieve mutual goals. Also, the use of collaboration philosophy emphasis on that cooperation should be used throughout the organization, not competition. However, in order to fulfil the criterion for collaboration philosophy organizations need to make severe changes to their organizational culture and climate (Kahn, 1996).

Conclusions drawn from Kahn's study (1996) are that management should consider initiatives that encourage departments to achieve goals collectively, to have a mutual understanding and to share resources. Organization should not just consider team integration when integrating different units. Often, teams are temporarily and after their work tasks have been finished they begin working with other group activities, this can lead to that team members can find it difficult to adapt to new situations.

What can be done if some of the two described philosophies are dominant in an organization? Kahn (1996) elucidates that if interaction is dominant the interaction degree among employees must be decreased. New interaction systems can be installed to solve the problem i.e. communication and electronic interfaces. If collaboration philosophy has the upper hand, i.e. documentation is close to nothing and members are not aware of current activities in the organization, interaction should be introduced. Kahn (1996) advocates that the degree of collaboration should not be reduced because of its positive effects on the organization's performance. Instead, interaction should be introduced as an encouragement for performance and collaboration. Therefore, interaction would act as a balancing medium between the two processes.

3.2   Portals and users

The issue of implementing a new system within an organization, such as a portal, can indeed give organizations advantages, but also disadvantages. Therefore, it is vital for organizations to consider user needs when implementing new solutions. According to Detlor (2004a), the main intention of a portal is to signal the potential value of information to users. But in order to do so, different underlying factors have to be considered, that are not Information Technology based, such as training of personnel and user involvement (Adams et al., 1992). In order for the new system to gain user acceptance issues of navigation, personalization, searching and how the users adopt the system have to be considered. In this chapter, these different issues will be described, as well as an overview of a portals main objective within an organization.

3.2.1   Portal

"An application that enables companies to unlock internally and externally stored information, and provide users with a single gateway to personalized information needs to make informed business decisions. " (Shilakes & Tylman, 1998, p. 1)

Although knowledge management is not all about technology it plays an important role within this field. Technology facilitates the process of transmitting and exchanging information (Al-Hawamdeh, 2002; Detlor, 2004a).

Figure 2 below shows a fragmented view of information without the portal:
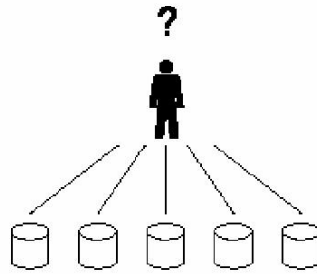
A Fractured View of Information

Figure 2. A fragmented view of information (Detlor, 2004b, p 6)

The portal is a popular web-based knowledge management solution. The primary purpose of the portal is to navigate people; its secondary purpose is to provide unique content. A portal is a stark contrast compared to other types of Internet sites, such as external or departmental Web sites where the primary purpose is to disseminate information and to keep people at that specific site (Detlor, 2004a).

Detlor (2004a) argues that a portal is just an information system, it is not knowledgeable itself rather it allows its users to be knowledgeable. The real purpose is to signal the potential value of information to users. The main objective is to present information to users in a way that makes them understand and comprehend information sufficiently enough so that they can put the information into use. A way of illustrating how this information is presented with a portal is shown in figure 3.

Portal
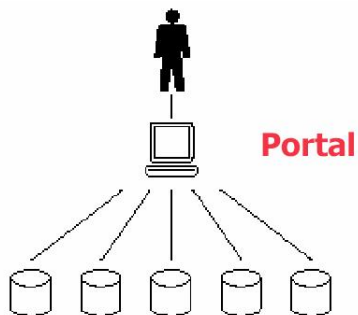
An Integrated View of Information

Figure 3. An integrated view of information (Detlor , 2004b, p 6)

3.2.2 Personalization and customisation

> "The goal of personalization is to deliver content relevant to an individual user or group of users based on their roles and preferences." (Aneja, 2000, p. 4)

During the last few years, information technology and the Internet have exponentially increased the amount of information that has to be processed every day (Aneja, 2000; Choo, 2000; Detlor, 2004a). Information is delivered in an astonishing pace and from a dizzying array of sources such as e-mail, news, documents, reports, articles, digital files, video and audio files and transactional data. A major issue is that it is difficult to take advantages of this wealth of information because it is buried in separate, often disconnected and disorganized repositories (Aneja, 2000). Due to the increase of information sources it has become critical for organizations to implement powerful but still easy-to-use engines, as well as directory-like structures that facilitate browsing and personalized information that users view (Choo, 2000).

The large rise of digital data and information (transactional data, documents file severs and audio files) that are being stored calls for use of portals (Shilakes & Tylman, 1998; Aneja. 2000). Through a single gateway, a portal, users will be able to find, extract and analyse all of this information. There is a shift of focus away from the actual content of the information to the context in which the end-user consumes the information, whether the end-user being an employee, customer or supplier. In the end, information consumers will benefit from the data and information by accessing, mining and transferring it into disparate applications where it can be used again. Organization will be able to "adjust" each user's portlet according to the individual security levels and access authorization, and a user will be able to personalize their portlet to find access and search available sources of relevant business information. Through the portal, Shilakes & Tylman (1998) argues that users will make better corporate decisions by providing powerful software and faster access to relevant, accurate, and timely information. The personalized, relevant set of information will also be critical to the overall portal implementation (Aneja, 2000).

Ways of using a portal is almost immeasurable, but today the most common is employee-related transactions (Bannan, 2002). Choosing a portal is not just about issues such as infrastructure and the long list of information- and system-architecture that should be resolved. In the end, the main area concerns how a portal addresses and handles tasks that the business deems as the most crucial. Using a portal does not automatically reduce information overload. In order to do this support from strong identity management along with role-based customisation and personalization has to be provided. When using this support properly; users log in once and interact with information that is tailored to their jobs. This could be done through data fed from a legacy database; content- or document management system; another portal; or a new internet-based application (Heck, 2004).

User information and preferences could be stored in architectural components such as personal profiles. These profiles can be created from information manually entered by the user, or by gathering user information from existing databases. Portal services can then use these user profiles to tailor the content for the user. Often, when creating a personal profile for users, it is difficult to specify all their preferences up front; due to the fact that

their preferences evolve over time. Through analysing and monitoring user's behaviour an automatic profiling can address the issue of out of date user profile data. User should also have the ability to modify and update their profile data. Privacy is always a significant issue; therefore private data strategies should be established to effectively protect private data. Due to the fact that many companies have specific privacy laws and requirements; an understanding of international privacy laws is critical (Aneja, 2000).

3.2.3 Searching

In today's organizations, it gets more and more indispensable for employees to quickly be able to find and share relevant information. Information has to be processed and understood by participants who are often distributed on dispersed geographically and virtually throughout the world (Gauvin et al., 2004). At the same time, the continuum of information distributed through out intranets and Internet increases, which gives rise to different difficulties when searching for information (Smith & Ng, 2002). When users retrieve information through the use of searching, the particular user knows in advance, what he or she is looking for. On the contrary, when users look for information and rely on serendipitous findings it is called browsing (Feng et al., 2005). A key prerequisite for portals is to provide a search that globally connects different information sources, irrespective of used software or platform (Priebe & Pernul, 2003).

What factors affect on user's ability to search information? The issue of describing how different people search and use search engines depends on many different factors. According to Kulviwat et al. (2004), factors influencing users' ability to find what they are searching for depends on their perceived benefits/costs of the search and their ability to search.

- *Perceived benefits of search:* The degree of ease of use of the searching i.e. how effortless it is to handle and use (Davis, 1989). Another factor influencing perceived benefits of search is the effectiveness of the search (Kulviwat et al., 2004) i.e. to provide relevant information to the users in the right form and context (Williamson, 2003). If fulfilled, these factors will inhibit user satisfaction (Kulviwat et al., 2004).
- *Ability to search:* The user's previous education has a great impact on their ability to search on a web site, as well as their previous experience with searching. Education in this case, can involve knowledge about technology (Kulviwat et al., 2004).
- *Perceived cost:* Involves how users measure the costs of using the search technology and it involves factors such as time issues and the effort of finding specific information (Kulviwat et al., 2004).

What facilitation techniques are there to help users search activities? Xie & Cool (2000) states that help mechanisms such as browsing features, relevance feedback and search assistance are key concerns when defining a search strategy formulation. Help mechanisms enhances the use of the system. Poor designed help mechanisms will be considered as a hinder of use by the users. Throughout a survey made by Xie & Cool

(2000), they found out that these help mechanism facilitated, to a great extent, the user's ability to find desired information.

- *Browsing features:* Can be in the form of table of contents, these might facilitate the efficiency of search through that users can formulate and reformulate their search strategies. This is very useful when e.g. topics, subjects or names of documents are unknown.
- *Search assistance:* Can be useful for users that do not have broad experience in searching. The assistance contains tools that users can use, such as remembering intricate commands, so that the complexity of searches can be reduced.
- *Relevance Feedback:* Feedback from searches was seen as being a vital factor, feedback can be given in form of index features i.e. index terms and descriptors. According to Xie & Cool (2000) relevance feedback gives users a sense of control.

3.2.4   Navigation

Navigation refers to:

> "The process whereby people determine where they are, where everything else is, and how to get to particular objects or places." (Jul & Furnas, 1997, p. 44)

Finding ones way through the labyrinths of available information can be a hard task to manage and handle. The concern of not finding specific information can lead to that users', who uses a particular system, get frustrated and lost in searching and navigating activities. New ways of navigating must be considered. The usage of good interfaces and information design can be a step closer to realizing the benefits of having a good navigational structure within a portal (Jul & Furnas, 1997).

Mack et al. (2001) states that navigation is a form of browsing on a large number of documents. Navigation within portals is used to present information for users and provide information to them that is suited for their work tasks. Mack et al. (2001) advocates that navigation should be seen as a complement to searching whereas users search for information and then the navigational structure present suited documents for the users. This action can be seen, in some cases, as user-driven as users tend to search for information and then decide how they want to analyse and use it. Thus, navigation does not only contain or provide user-driven actions; there are restrictions. The foundational structure is built upon values addressed by administrators and designers within the organization. Also, it contains limitations of used technologies, which can confine how and to what degree that the users can navigate throughout the portal.

How information is presented and moderated within an electronic media can be divided into two different groups i.e. moderated and non-moderated spaces (Jul & Furnas, 1997).

- *Moderated spaces:* All metadata and the whole structure of it is known and controlled by moderators, which means that moderators can "map out" a scheme over the whole process. There is a clear definition of how information

is presented in the electronic media and therefore navigators get a clear map on where to find and look for specific information.

- *Non-moderated spaces:* The foundational structure is not known for the moderators, it is hard in advance, to predict what metadata it should contain. This state is close to anarchistic, and can be described as the World Wide Web. The result would be that navigators trust their own ability to find information on a serendipitous manner. Hence, navigators need to draw their own map of where to find information and where to find good sources.

Chen & Stanney (1999) defines in their article different factors that are needed by users in order to enhance their navigational ability within an electronic media. Experience is a vital factor in order to determine what a user can get out of a search. Previous experience and training will enhance how users adapt to new environmental variations and therefore they will acclimatize and search better, when confronting new situations. Chen & Stanney (1999) also pinch out that motivation among users are needed in order for the navigational ability to increase, as well as how they tend to search for information.

3.2.5 Portal adoption and use

The issue of implementing a new technology in an organization has many underlying factors that are not associated to the technology itself. Factors that do affect the decision are e.g. training, support, user involvement and user expectations (Adams et al., 1992).

According to Davis (1989) user acceptance, which indeed facilitates the adoption of a portal, must be built upon two fundamental factors:

- Perceived usefulness
- Perceived ease of use

These two factors are therefore determinants on whether the introduction of a new computer system will gain a fair amount of user acceptance so that it can be adopted into the user environment and into an organizational context. Otherwise, if no user acceptance is gained, user's unwillingness will constitute a hinder performance gains of the system.

Davis (1989) explains perceived usefulness as:
> "The degree to which a person believes that using a particular system would enhance his or her job performance." (p. 320)

Additionally, he explains perceived usefulness as a term in where users act after their ability to imagine and believe the potential facilitation degree of the system, whether it facilitates their work tasks or not. In contrast, perceived ease of use is defined as:
> "The degree to which a person believes that using a particular system would be free of effort." (Davis, 1989, p. 320)

Davis (1989) claims that systems that have a high degree of perceived ease of use will have a larger potential to gain acceptance from users, in contrast to a system that has a low degree. Although, these two described factors (perceived ease of use and usefulness)

are not the only aspects influencing the user acceptance; however Davis (1989) advocates that these factors are likely to place a central role in adoption of the system.

In Davis (1989) discussion, he put forward interesting analyses on which of these two factors that plays the most central role in the adoption of a system among users. According to the surveys done by Davis (1989), conclusions can be drawn that usefulness correlate stronger to user acceptance than ease of use do. Davis (1989) suggests that users adopt applications or systems primarily on the basis on what functions the system or application performs for them. Secondarily, the users assess complexness of the system i.e. how hard or easy it is to get the system to perform and provide the needed functions and operations. Users tend to be more open to some difficulties within systems, if the system provides critical information for them. Davis (1989) also explicates that the difficulties of use hinders and discourages adoption of a system, even if it is vital for users working environment. Hence, no amount of ease of use can compensate for a system that does not perform useful functions to the users.

Adams et al. (1992) advocates in their article that it can be problematic to measure the impact of Information Technology, when it comes to measure it in form of usefulness and ease of use. In some cases, the usage of systems is not voluntary. As a result, these factors may have little effect on the overall levels of use. Additionally, problems can occur when the usage is practically voluntary, it may be no other alternative than to use the system in order to effectively complete their work tasks. Analyses and tests done by Adams et al. (1992) on Davis (1989) work have in some case shown similarities. Adams et al. (1992) agree that there is a strong correlation between perceived usefulness and usage, while perceived ease of use is less important to determine the use of technology. However, Adams et al. (1992) elucidates that these factors can dissociate depending on which software packages that are used i.e. popular software packages would be rated higher in terms of usefulness and ease of use among users.

Benbya et al. (2004) concentrates on describing adoption of portals with three different contexts. Two contexts were deemed as essential for our study these are: the technical context and the social context.

Technical context
The adoption of a portal within an organization can be hindered by many different factors. Benbya et al. (2004) explicate that badly designed or ineffective technologies results in an ignorance of information needs. The ignorance is often based upon how the portal is designed, and conductive factors are:

- *Poor functionality:* Users will adopt portals that provide functions that will satisfy their needs. Another apprehension that may exist is the bias of " the more the merrier" i.e. flexibility will be enhanced by providing many functions to the users. Instead, if the system contains many functions the overall usability of the system will be reduced (Goodwin, 1987).
- *Poor usability:* A design of a new system is not enough for satisfying user needs and to enhance the adoption of a portal. There are many factors that lie beyond the

design of the system that may inhibit adoption, if they are not considered. A factor that inhibits adoption is how users valuate the usefulness of the system; users need to feel that the system is useful and facilitate their work tasks (Davis, 1989).Factors that exhibit adoption of a new system are training, accessibility and culture of the workplace (Goodwin, 1987).

- *Poor design:* A poorly designed system may take control over user's work place and how they perform tasks. The result of a poor design would be users do not have control over their own work situation (Boivie et al., 2002). Design that does not take user's needs into consideration will not exhibit adoption of the system (Bødker & Iversen, 2002). The design of a system is a crucial part in any organization. Structures within organizations are shaped through the use of computer systems and they are often determinants of organizational success (Lucas, 1971).

Social context

The social environment, in which users operate within an organization, can have an inhibited or an exhibited effect on how the portal is adopted by the users. Organizations that possess a positive social interaction culture will socialize more extensively i.e. management and users exchange information, share knowledge and interact on a higher degree. On the contrary, organizations that promote behaviours where individuals work on their own will more likely struggle with information sharing problems. Therefore, an organization that promotes work task on an individual level will have an organizational culture where users are reluctant to give away their knowledge, because it is too valuable for them (Benbya et al., 2004).

Another issue that needs to be addressed, when it comes to a social context, is the matter of different worldviews in multinational organizations. Chevrier (2003) states that divergent worldviews can lead to two different outcomes. One point of view is that an assortment of different cultures and worldviews could lead to a larger knowledge base for cross-cultural teams to exploit, when facing complex problems. Another aspect is that an assortment of cultural worldviews increases ambiguity, complexity and confusion in group processes. Hence, the outcome of the group's performance will be that the efficiency would decline. Benbya et al. (2004) summarizes, in their article, with that organizations are getting more aware of that cultures and users within an organization is the driving forces for success or failure of a knowledge management system.

3.2.6 Participatory design

The issue regarding user needs, when it comes to implementing a new computer system within an organization is a concept that has been widely discussed for a long time through academic literature (Riley & McConkie, 1989; Richardson et al., 1998; Gärtner & Wagner, 1996. Detlor (2004a) describes in his book that when portals are implemented into an organizational context, in particular, participatory design should be considered in order to regard user needs.

Detlor (2004a) explains in his book that participation design falls underneath the subject of user-centred design, although there are some differences between the two concepts.

While traditional user-centred design falls under the wings of usability testing and software engineering, participatory design uses, according to Detlor (2004a), user involvement in a much broader sense. In participatory design, users have the predominant role, when decisions are made about the design of the initiative. In opposite to many other design processes, users are seen as the experts, instead of designers. The reason why is because users know what they need and what they are missing in current systems. Therefore, designers are just seen as consultants who help and implement user's needs.

Kensing & Blomberg (1998) illustrates in their article three objectives that users, under an active participation, should be able to affect under the design:

- Analysis of needs and possibilities with the new computer system
- Evaluation and selection of technological components to the new system
- Design of prototypes

To explore different participation areas and different design stages Gärtner & Wagner's model will be used (Gärtner & Wagner, 1996). According to Gärtner & Wagner (1996) an elaboration of a complex system is not entirely bounded to one unit in the organization, instead the sphere of influence when designing new systems comes from different parts of the organization. The involvement of users tends to be located at different places within the organization and intervene on different occasions for engagement in design and participation. Gärtner & Wagner (1996) divides participation design into three different stages, or arenas, whereas participation can occur:

- Arena A - Designing Work and Systems
- Arena B - Designing Organizational Framework for Action
- Arena C - Designing the Industrial Relations Context

Arena A: This arena consists of the design of new systems. Work conditions and working skills within the organization is objectified and identified. This stage consists of an extended participation between designers and users in order to investigate these conditions. The stage concludes in making pilots of what has been identified throughout the stage (Gärtner & Wagner, 1996). Kensing & Blomberg (1998) add to Gärtners & Wagner's model that this arena is an individual project arena. Users are divided into project groups and take an active part in the analysis, design and the organizational implementation of the system.

Arena B: The stage consists of group discussions to find cooperating issues within the organization. In this stage, Gärtner & Wagner (1996) explicate that participation is more indirect and often divided into the different parts of the organization i.e. the global cooperation are reduced to just cooperating within the organization locally. The conclusion of Arena B will be a redesign of the conditions that the new initiative would contain i.e. what information it would consist of, roles in computer system and regulations of rights between the different actors in the process.

Arena C: In this stage the design is taken to the next level, the arena operates on a global level and it consists of a definition of relationships between different partners. Decision-making and political agendas are often made on a global arena, which in turn affect the local arena. According to DePaula (2004) a national arena or a global can be federal regulations, policies and so on. In conclusion, local initiatives has to be adjusted so that they can fitted into the framework of the global arena i.e. to make the new system work world wide it has to be locally adjusted so that all local arenas use the same federal regulations, policies and so on.

The question still stands on who are assessed to be a part of the participation design? According to Kensing & Blomberg (1998) it is not possible for all users, affected by the new initiative, to be able to participate under the new design of the system. Hence, user participants must be negotiated with organizational members so that representatives of workers can be chosen. In conclusion, the choices of deciding the representatives must be carefully considered and it is very important to clear out the specific motivations of why the participation should be conducted.

3.3   Information environment
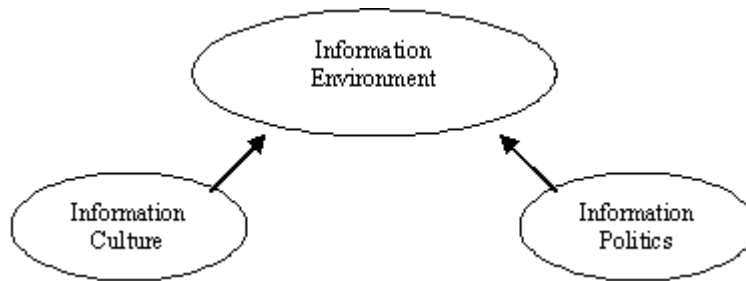
Figure 4. Information Environment

Organizations need a healthy and supportive environment in order to support knowledge creation. Detlor (2004a) argue that a healthy and supportive information environment would be one that promotes consensus and negotiation among portal information stakeholders. The adoption and the final use of the portal are very important issues when implementing the portal. Therefore, the organizational culture, information system development process and information politics are very important to highlight. Figure 4 illustrates that the information culture and information politics are two important areas that influence the information environment.

3.3.1   Information culture

> "Information culture determines how much those involved value information, share it across organizational boundaries, disclosure it internally and externally, and capitalize on it in their business." (Davenport, 1997, p. 35)

An adoption of IT in an organisation and the ability to transfer and access information quickly and efficiently are factors that are not sufficient enough to ensure success (Curry & Moore, 2003; Davenport et al., 1992). The culture within an organization must be

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conductive to participatory information management. In order to be successful, the gap that exists between various stakeholders within an organization needs to be recognized. Information has a certain value to an individual and a certain degree of value as a corporate asset, therefore the user could be seen as a contributor to the knowledge management system. Depending on the users some will share knowledge willingly, others will hoard knowledge, others will be indifferent and will therefore share randomly and others will still engage in selective sharing (Curry & Moore, 2003). There are different kinds of knowledge and some of them are perceived to have a greater value. Explicit knowledge such as a training manual will not be seen as a valuable individual asset. Knowledge such as lessons learned from a certain project and experience are kinds of knowledge that has the greatest potential of being considered as an individual asset. This kind of perception of value and knowledge will influence the information culture.

There are many factors that affect a knowledge project; one of the most important is a fit with the culture (Davenport & Prusak, 1998). A great deal of knowledge is passed through informal networks, across networks and communities of practice. These functions of networks must be facilitated if you are to manage knowledge. Davenport & Prusak (1998) argues that you initially must make sure that these are functioning well and then apply the technology to ease the capture and sharing of knowledge across a network. An implementation of technology to enable the free flow of information does not itself constitute an information culture. In order to achieve a successful information culture you need to have the support and cooperation of key personal (Curry & Moore, 2003).

Detlor (2004a) identifies tree sub-factors as being significant when it comes to the impact on adoption and use of a portal by organizational workers, these are:

- The employee's willingness to share information
- Information overload
- Control over portal standards: deals with the organizations desire to control information presented and displayed on the portal and standardize the companies' look and feel.
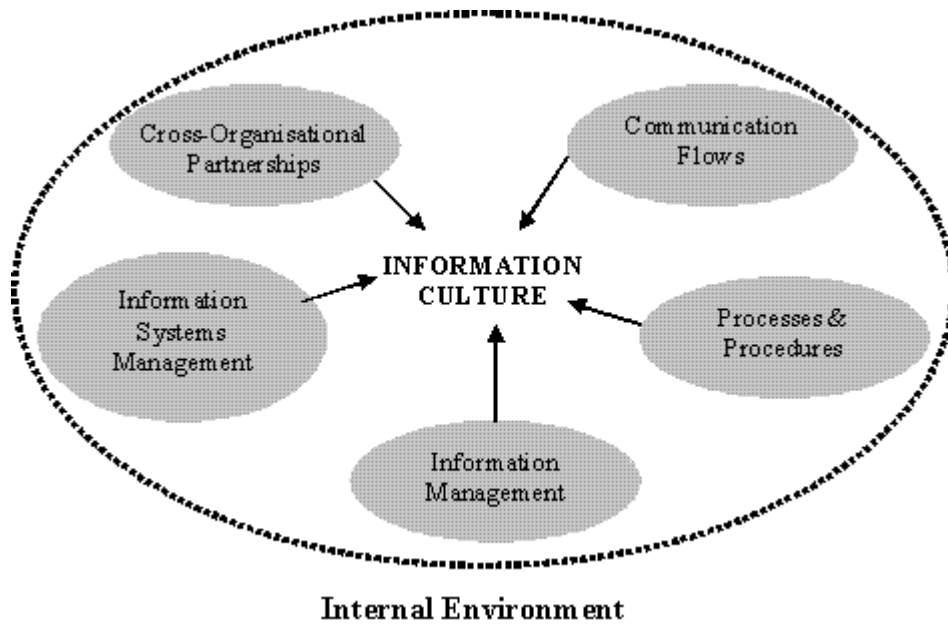
Figure 5. Modified figure of Evolution of information care (Curry & Moore, 2003, p 95)

Figure 5 illustrates the parts that are necessary for an information culture to flourish. The following components are from Curry & Moore (2003):

- *Communication flows:* Here the importance of having an effective organizational communication is high lightened. It is a complicated two-way process where effective downward flows communicate managerial decisions whilst upward flows represent employees' ability to provide feedback and participate in decision-making
- *Cross-organizational partnerships:* This is related to the organisational synergy and how different functions and departments work together. A departmental integration and interdepartmental collaboration tend to reduce rivalry and empire building.
- *Internal environment:* Arguably the greatest influence on organizational culture is people. Open access to relevant information and co-operative working practices is required within an information culture. It is vital to have an atmosphere of trust, as well as the human resource function that plays a critical role in the shaping of organizational culture and therefore also information culture.
- *Information system management:* The Information System strategy should be closely linked to the business strategy. User acceptance is a critical factor for success and therefore a key element when implementing. The design is very important due to the fact that it affects how organizational members interact.
- *Information* management*:* An implementation of technology does not automatically mean that you have an information culture with a free flow of information. An information culture does not require accessibility to all information. Some information cultures will always require specialist skills and knowledge. The most important is that the users have access to all the information they need in order to fulfil their daily task.
- *Processes and procedures:* Documents of key policies, processes and procedures within an organisation are indicators of culture. This kind of information should be

limited to critical success areas and should not be bureaucratic. In order to establish an information culture it is very important with clear guidelines and documentation for IS management, information- and data management.

Curry & Moore (2003) argue that in order to achieve an information culture it requires senior management support; the emphasis should be on co-ordinated leadership rather than imposing from the top-down. The leadership style needs to reflect the links between organizational culture and information culture. This participative leadership style should emerge at all levels of organisational activity in order to move away from empire building and information hoarding.

3.3.2 Information politics

"Information politics refers to the human struggle over management of information, in this case the management of portal content and application. " (Detlor, 2004a, p. 92)

Davenport et al. (1992) extensive research argue that:

"Only when the information politics are viewed as a natural aspect of organizational life and consciously managed will true information-based organizations emerge." (p. 53)

As studies have shown, information-oriented companies are the ones least likely to share information freely (Davenport et al., 1992; Detlor, 2004a). This may not be so surprising, due to the fact that the unique information users hold defines people's jobs. Many view information as a source of power and they may be less likely to share this certain kind of information. According to Davenport et al. (1992) users could have quite legitimate reasons for withholding information. It is argued that the political behaviour should not be viewed as irrational or inappropriate but as a normal response to certain organizational situations. When information is shared it has more often occurred within rather than across functions (Jarvenpaa & Staples, 2000).

One of the major reason for IS failure, according to Curry & Moore (2003), is the failure to address or recognize the culture gap between different stakeholders within an organization i.e. those who implement the systems and who those actually using them, and the information politics at play. New organizational structures with a shared stance should also be adopted in order to be successful. Detlor's (2004a) research shows some of the problems that can occur within the information culture. Although, his research show that many users are willing to share information and that they are more likely to do this if the access to the information was restricted to pre-defined individuals only. This was due to a fear of reprisals when making ideas and documents public.

Davenport (1997) argues that companies frequently attempt to apply information strategies or initiatives that are inconsistent with their political structures, which lead to that they fail. The importance of information politics is often ignored; the governance is often more prioritised even though Davenport (1997) acknowledges it as equally important. One of the main factors, which are pointed out by Davenport (1997), is the fact that managers need to talk honestly about the political nature of information, regardless of how they decide to govern it.

These following five information political models were identified by Davenport et al. (1992):

- *Technocratic utopianism:* This is a belief that technology can solve all problems of information governance.
- *Anarchy:* In this individuals manage the information, often at their own peril.
- *Feudalism:* Business units define their own information needs and report limited information back to the corporation.
- *Monarchy:* One central person dictates information management policies on behalf of everyone else.
- *Federalism:* The use of information is done in consensus and negotiation among business units.

Any of the four models described may be desirable for some type of organization. They form a continuum of local vs. centralized control of the information environment. The degree of control within the models is showed in figure 6.
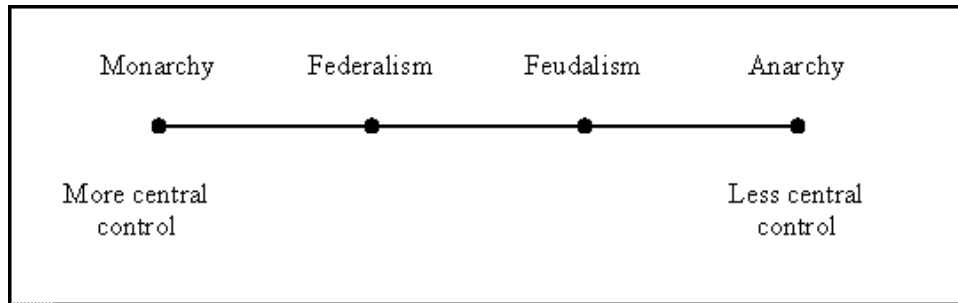
Figure 6. The continuum of information control (Davenport, 1997, p. 69)

Technocratic utopianism is a model that Davenport (1997) clearly dislikes the most and has not much positive to say about it:

> "It is the biggest crime is distracting managers from addressing the real issues of information governance."(Davenport, 1997, p. 78)

The above-mentioned models are strategic choices that organizations make surrounding information governance. So how should a firm begin to effectively manage information? The first step is to select a preferred information model. One should also figure out which model that predominate the current situation, which is the most desirable, and how to achieve it (Davenport et al. (1992).

Two viable choices among the five models are recommended by Davenport et al. (1992) these are: monarchy and federalism. A business culture that celebrates empowerment and widespread participation is suited for federalism, this is harder to achieve and it takes more time. Within federalism, you require managers that negotiate with each other in good faith in order to avoid the temptation to use and withhold information destructively. Many firms have the objective to reach federalism, but find it impossible and therefore choose monarchy, due to it being as effective and easier to implement.

Just recognizing the politics of information and managing them is a time-consuming task. It is important to understand that this will not happen by itself nor will the problem go away. In order to manage information politics a shift in organizational culture is required: new technology and even new executives will not be enough to make it happen. All managers must care about it and be involved in the process. Information must be viewed as something important for the success of the organization and spend time and energy to meet their information needs (Davenport et al., 1992).

In contrast to the traditional view of Information Systems, the World Wide Web has a considerable different view concerning information management:

> "The World Wide Web (W3) was developed to be a pool of human knowledge, which could allow collaborators in remote sites to share their ideas and all aspects of a common project." (Berners-Lee et al. 1994, p. 76)

Internet was prompted by the positive experience of a small limited hypertext system used for keeping track of personal information on a distributed project. In the early days Internet was designed so that it was used independently by two projects. Later, when new relationships were found no major or centralized changes would have to be made. The information provided could be smoothly reshaped to represent the new state of knowledge; it is this property of scaling that has allowed Internet to expand (Berners-Lee et al., 1994). Traditional information systems relied on well-defined user domains that strictly enforced access control, which on the other hand affords a bottom-up approach to information dissemination and it does not restrict publication rights to management functions only. On the contrary, it acknowledges that anyone in the organisation may have valuable information to share (Stenmark, 2004).

Internet has become a huge success in terms of content and use which also companies have realized and have therefore brought this technique inside their organization. These intranets, with a shield against the rest of the Internet, have the potential of changing how companies conduct their business internally. Intranets and the public web use the same technique but are different in many aspects (Stenmark, 2004). The web still honours the principles outlined when originally designed, such as heterogeneity, non-centralization, and remote accessibility. The intranets on the other hand have taken the direction of being more standardized and control oriented in a way that shaped organizations in the industrial age (Stenmark, 2004).

Four obvious and fundamental differences between intranets and Internet are identified in table 3 by Stenmark (2004):

Internet	intranet
Content is provided in a democratic, bottom-up fashion	Content is provided top-down by a small group of professionals
Content is diversified and subjective and detailed information is available on almost any topic	Content is non-specific, "objective", and to a large extent business related
Content is intended to attract visitors and content providers measure success in terms of number of visitors	Content is intended to disseminate official information in which the content provider has no vested interest
Content is hyperlinked in an user-driven and seemingly ad hoc manner that transcends fixed categories	Content is organised according to a pre-determined corporate taxonomy manifested in consistent menus

Table 3. Major differences between Internet and intranet content provision (Stenmark, 2004, p 9)

3.4 Information design

> "Information design is the activity of developing representation of complex data and knowledge resident in internal processes." (Leonidas, 2000, p. 73)

The design of a portal affects how users interact and is high lightened by several authors (Curry & Moore, 2003; Detlor, 2004a; Leonidas, 2000). Detlor (2004a) defines information design as:

> "The effective and efficient presentation of information on Web spaces as a means of raising awareness of the potential usefulness or value of the information displayed to users." (Detlor, 2004a, p. 119)

With this view, information design is a vehicle that assists users in their sense making behaviour. The prime objective is to enable people to interpret and re-interpret information presented to them as a means for fostering knowledge creation, distribution, and use. Information does not only concern the transmission of facts to users, it also concerns helping people to interpret the meaning behind the information presented to them. Good information presentation is very important: it has a direct link to effective knowledge creation, distribution, and knowledge throughout an enterprise. This means that the information presentation becomes critical and vital in order to signal the potential worthiness of information pieces that is presented to organizational knowledge workers throughout the portal interface.

Information design suffers from comparisons with graphic design, which is sometimes problematic but maybe inevitable. The graphic designer's vision is one of aesthetic priorities compared to the information manager, which is about effective management of information. Information designers use process analysis and information visualisation to clarify patterns and streams of information and organizational actions, indicating junctions, relationships and interdependencies, using a user's perspective.

Information design closes the gap between data and knowledge in an organisation and its effective management, by developing methodologies for analysing and displaying complex information (Leonidas, 2000). An information manager must bring together and combine a large range of skills; including writing and editing, typographic and diagrammatic design, and computer interface design (Leonidas, 2000).

3.4.1 Information architecture

There is no one accepted definition for the term *information architecture*; White (2004) highlights the four following definitions:

- "The combination of organisation, labelling and navigation schemes within an information system;
- The structural design of an information system to facilitate task completion and intuitive access to content;
- The art and science of structuring and classifying the following Web sites and intranets to help people find and manage information; and
- An emerging discipline and community of practice focused on bringing principles of design and architecture to the digital landscape. "

<div align="right">(White, 2004, p. 219)</div>

Commonly understood; Information architecture (IA) is the art and science of structuring, organizing, and labelling information so that the content owners can manage it better which could lead to that users find what they are looking for in a more effective manner (Byrne, 2004). A reason to think architecturally is that information is dispersed throughout the organization. The information arrives to the firm from different sources; it is stored in different media, formats and it is used in a variety of places (Davenport, 1997). Therefore it is not surprising that workers often has a hard time accessing information that already exists somewhere else in the organization (Davenport, 1997;Verity, 2004). This explains why companies waste millions of dollars duplicating information that already exists. The answer is not to reduce the number of information sources; sometimes information is only valuable if it can be assembled from diverse sources and locations (Verity, 2004).

Information providers can improve the value that he or she adds to information by making it more accessible. Through the information architecture (by guiding the user to information's location) the likelihood of successful use increases. Guiding the users and letting them know of available information can easily reuse information obtained. This will of course decrease the costs of acquisition and storage because when users know what information is available, they are less likely to purchase it or create the same information again (White, 2004).

IA can either be bottom-up (i.e. analysing and labelling content chunks) or top-down (i.e. developing standardized categorization schemes or taxonomies). This traditional approach for IA does work not so well when developing information architectures at the enterprise level as it present another dimension altogether. According to Byrne (2004) enterprise wide information architecture should define a model for working with

disparate business units in a way that presents employees and customers alike with a unified way of accessing information across the whole organization.

3.5 Summary

The design and usage of a portal can be affected by many different factors. There are three different entities: user, information environment and information design that must work in tandem before the extent of how a portal can utilize knowledge creation, distribution and use can be measured.

Information sharing and collaboration are two essential parts within a portal that has to be considered. When making decisions, there is an essential need to handle information so that decisions can be performed and be accurate. Information sharing through portals is affected by factors such as willingness to share and social ties. Individuals that hold stronger bonds will more likely share information. Collaboration has become indispensable for organizations and it has become a crucial component for joining virtual disparate teams.

A portal can be seen as a facilitation medium for unifying disparate sources and joining fragmented intranet environments. Users primary adopt a portal based on what functions it contains. Vital functions that a portal must contain are searching, navigating and personalization and customization. These functions are effective methods for providing a basic structure and are the foundation for a portal so that users can perform their everyday work tasks. Therefore, in order to fully use their capacity it is vital to consider perceived ease of use and perceived usefulness of the portal i.e. how the portal affects user's job performance and the effort that is needed by the user to use the new system. The design and functionality of the portal are also deemed as essential. Other issues brought up related to user adoption is participatory design, information design and information architecture. Participatory design refers to user's involvement in the design process of an information technology. In brief, information architecture refers to assembly of a portals structure and labeling of information so that users can find what they are looking for. On the contrary, information design deals with methods for designing efficient and effective ways of presenting information for users.

When considering an organization dispersed through the world, the issue of cultural barriers arises. Information culture refers to how information is distributed, valued and shared across organizational boundaries. Information politics can also have a cultural impact, companies that are information-oriented are the ones that are least likely to share information freely due to the fact that unique information that users hold defines their jobs. In order to handle information politics a new shift in the organizational culture has to be made, new technology will not be the only answer.

4 Empirical study

In this chapter we present the context in which our study has been conducted. The chapter begins with describing the results, which we have drawn from the Information and Knowledge Management survey that was conducted and presented to us during our study. This study was to be a foundation for the questions used in the interviews, which we conducted at the organization.

4.1 Overview of organization and the R&D portal

AstraZeneca is one of worlds largest pharmaceutical companies with approximately 62,000 employees worldwide (AstraZeneca, 2003). AstraZeneca's R&D organization is divided into seven large sites situated in USA, U.K. and Sweden. AstraZeneca R&D Mölndal is one of the major research sites with around 1700 employees; the main research areas at Mölndal are within gastrointestinal and cardiovascular. AstraZeneca Mölndal R & D is divided in two main areas: Discovery and Development. Within Discovery, scientists focus on finding new compounds (candidate drugs) i.e. preclinical research. Development aims to develop better drugs faster (AstraZeneca, 2005).

The overall goal of AstraZeneca R&D Portal project (R&D Information Management and Knowledge Management Project) is to improve information sharing and access to information within R&D and commercialisation of AstraZeneca's products. The main delivery was made in December 2004 and had the following features (AstraZeneca, 2004):

- Standard framework for sharing information and knowledge across the whole of the R&D process
- Creation of flexible collaborative workspaces to support information sharing, collaboration, and networking within working groups, projects, departments, communities of practice etc.
- Training, awareness and support for all users. Best practices on using the standard framework and information management.
- A better access to search and searching in multiple sources will be available for the users in the portal.
- Facilitate the migration and integration of R&D intranet websites into the portal environment.

4.2 Quantitative data: Information & Knowledge Management Survey 2004

The Information & Knowledge Management project within AstraZeneca R&D is trying to link Discovery and Development into a new framework for information and knowledge management across the new drug development process. In order to do this a survey was conducted; the goal of the survey was to establish a baseline (key concept) regarding the working environment. The survey consisted of 52 items in five dimensions. The dimensions were *working environment support (portal), information sharing, networking, evaluation and reflection, learning culture,* and *background variables.* We focused mainly on three dimensions out of five from the survey, these were: working

environment, information sharing and networking. Why we did not take the two remaining dimensions (learning culture and evaluation and reflection) into consideration was because they did not comprehend with the aim of our research purpose. The main reasons for choosing these 13 questions were that they were seen as problematic by us and by the organization. Primarily, these questions were seen as problematic and unsatisfactory due to a satisfactory analysis. Information in the survey concerns strategic information that has significant importance for the organization and projects. In the preliminary analysis, performed by the company, an analysis method denoted C13 benchmarking was used, as seen in figure 7 below:

P1 To what degree do you experience that usability in current IT infrastructure is satisfactory?
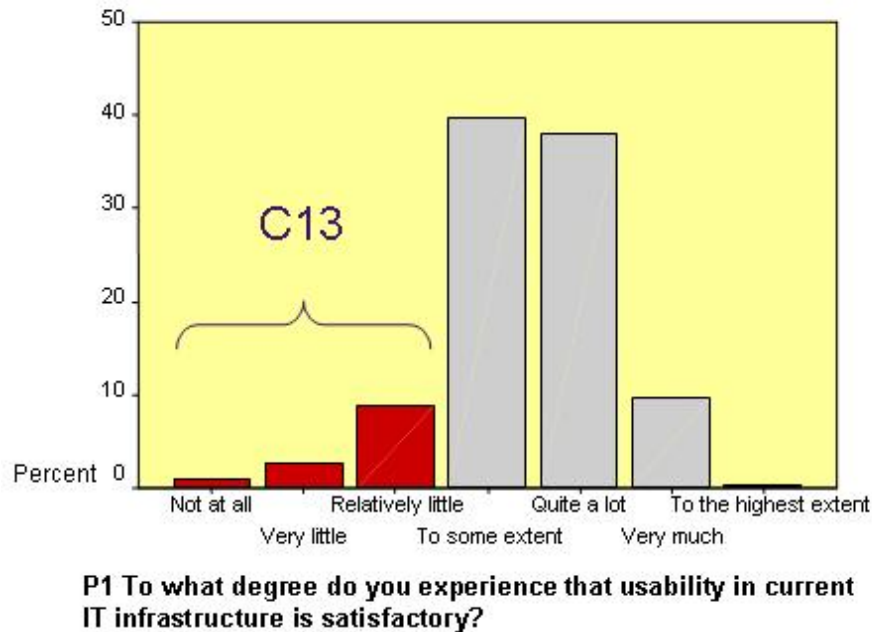
Figure 7. C13 benchmarking (Sundgren, 2004)

The basic principle with this method is to use a cumulative negative response from the response options 1 to 3 (e.g. items with frequency scale adding the sum of responses: Not at all, Very little and relatively little) for all items, in order to rank and distinguish them in respect of various degrees of perceived satisfaction. This was called C13 in the analysis report (Sundgren, 2004). C13 can be seen as a measure that represents a response that clearly perceived as unsatisfactory or unacceptable conditions concerning a certain question.

The primary objective of C13 benchmarking is to distinguish the overall result of the most negative survey questions. Figure 7 illustrate an example: item P1 which concern to what degree users experience that usability in the current Information Technology infrastructure is satisfactory. The response rate is in the above outlined example show a C13 value of 12 percent. This means that 12 percent of the respondents are not satisfied with the current Information Technology infrastructure (Sundgren, 2004).

Intervals for C13 benchmarking that were based on normative assumptions can be described as following:

- *Less than 15:* Good conditions, no current need for change
- *15 to 29:* Satisfactory conditions, Long term need for change
- *30 to 49:* Unsatisfactory conditions, Need for change
- *50 or more:* Problematic conditions, Immediate need for change

We will hereafter use the same technique for distinguishing the problematic and the unsatisfactory items that we deemed interesting and critical. 13 questions of the 52 questions were deemed relevant, with the use of benchmarking for our research question and were analysed further.

4.2.1   Result of chosen items
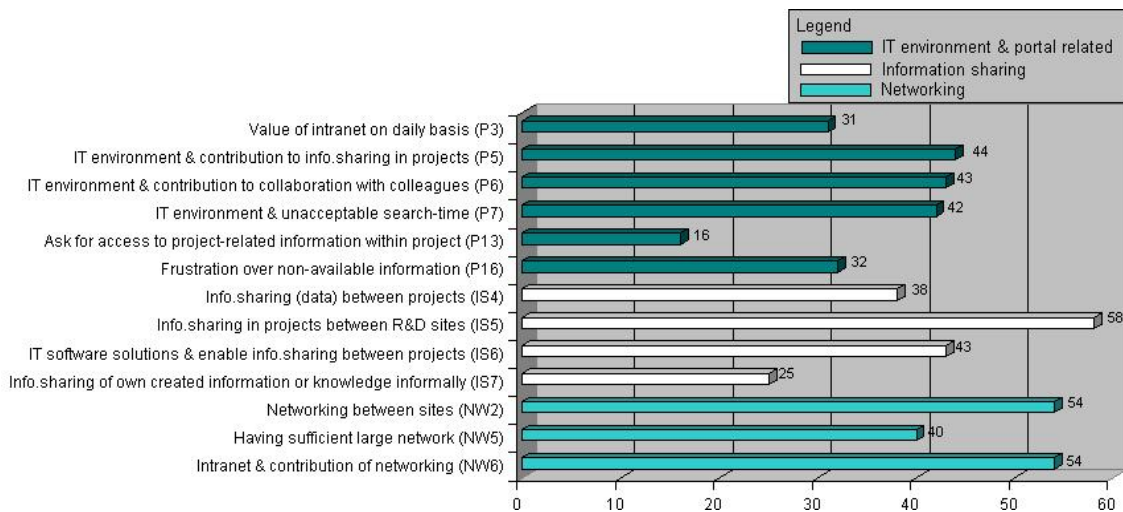
Figure 8. C13 benchmarking of chosen items

Figure 8, shown above, lists all chosen items: working environment, information sharing and networking. The table only regards C13 values from AstraZeneca's site in Mölndal. Figure 8 clearly shows the areas where the respondents are unsatisfied with the current situation, especially when bearing the C13 analysis in mind. Below, we argue why we have chosen the specific items in working environment, information sharing and networking.

Working environment
In the survey these items reflected the current intranet usage and whether or not the current intranet structure was satisfactory when it came to searching for and navigating within relevant information.

- *How often do you read information on the R&D site intranet that is of value for your daily work (P3)?*

This area was deemed as unsatisfactory by the organization as a whole with a high value of 42 percent according to the C13 benchmarking. This indicated that either the structure of the intranet was unsatisfactory or that too much information is displayed for the users e.g. information overload.

- *How often do current information environment contribute to your collaboration with colleagues in projects you are working in (P5)?*

Information sharing is something that was fundamental in our study and therefore this question was considered interesting. When analysing the results from the survey up to 30 percent of the users were unsatisfied with the current intranet usage as a contributor to collaboration.

- *How often do current information environment contribute to your collaboration with colleagues (P6)?*

As a whole this is the same as the question above. It was something that was considered interesting for both the organization, as well as for our research question. In this question over 30 percent of the users were not satisfied with the current information environment. This was a reason enough for us to consider it interesting.

- *How often do you experience that you must spend more time searching for internal information than is acceptable (P7)?*

Initially we had an idea that one of the issues that were problematic for the organization was the there was too much information presented for the users. This was confirmed when we saw the results of the question as it had a value of 48 percent on the C13 scale.

- *How often do you need to ask for access to project-related information within your project (P13)?*

This question was considered as problematic for the organization though it only amounted 16 percent on the C13 scale. AstraZeneca considered it being a question of high priority and that it had a too high value according to themselves. The value at the local site was not in significance higher than the rest of the world (17 percent). Still we considered the question being of interest to further research. Mainly because we believed that users should not have any problem with accessing information that concerned their project.

- *How often do you experience frustration because information is not easily available (P16)?*

Results of the survey clearly shows that there exits a frustration among the users, over 33 percent are not satisfied with the current situation. This is a question, which we believe is very important as it could affect the users view when implementing a new information system.

Information sharing

These items reflected in which way that the scientific information (as reports and primary data) was shared within and among projects.

- *How often do you feel that internal scientific information in form of primary data is shared between R&D sites to be used within projects (IS4)?*

Results from the survey showed that the information sharing of scientific information is not something that is done within the projects. More than 40 percent of the responses from the users show that this is an area that that was unsatisfied. We wanted to gain more information about his area and therefore was the question high lightened.

- *How often do you experience that internal scientific information is shared between R&D sites to be used within projects (IS5)?*

According to C13 this was an area that immediately needed change: over 55 percent of all sites that participated in the survey considered this area as problematic. Our immediately reaction was: how the results could have been so negative, which lead to that we wanted to study this item further.

- *To what extent does the current software solution enable you to make scientific information available over project boundaries (IS6)?*

This question was interesting due to that it referred to if they considered the current solution being sufficient or not. Responses from all users in the survey showed that there was a need for a change in this area due to the response of almost 40 percent considering it being unsatisfactory.

- *How often do you informally share project-related information or knowledge that your have created (IS7)?*

In order for us to get an idea for how the users share information this area was interesting. Is it custom for the users to share information and knowledge? The question leads to other questions such as if they share information to specific users or to users that they know can return information in turn to themselves? According to the C13 analysis, this was an area that had a long term need for a change, the response rate from all the users was 27 percent.

Networking

The aim for this area was to capture the frequency of knowledge and ideas exchanged within informal networks and the support that this exchange provides. Informal networks are in the survey described as different types communication and co-operation with colleagues in the company that occur outside the ordinary line and project organization

- *To what extent does the intranet contribute to different networking activities (NW6)?*

NW6 where considered firstly because it were seen as a critical factor throughout the C13 benchmarking. Secondly, as Kahn (1996) describes that departments within an organization often share common goals, shared visions and an emphasis on management of relationships through informal structures. Mutual goals are achieved through interdependency of departments. Figure 8 shows that these incitements for interdependency does not exist, or to a minimal degree. Therefore, we like to highlight this question and claim a higher level of interdependency between Discovery and Development

- *How often do you have contact with colleagues outside your ordinary line and project organisation at other R&D sites (NW2)?*

Why NW2 was chosen as a study object was because it is of high importance to make facilitation activities for users. When considering the current structure at AstraZeneca, it can be described as what Fenner & Watson (2000) explains in chapter 1.1. Fenner & Watson (2000) identified that companies use multiple intranets and groupware application which increases isolation of information and isles of information. Current situation at AstraZeneca does not fully foster networking across boundaries, as shown in figure 8 (Networking between sites). The distribution of projects throughout the whole world makes it harder also for members to utilize informal networking (Griffin & Hauser, 1996). This is a problem because, as Olson et al. (2001) explains in chapter 3.1.2, that collaboration gets more indispensable for organizations because of rapid changes in technology and pressures from the global market. This is the case for AstraZeneca, market pressures are especially a concern in pharmaceutical companies. Pressures from FDA and other federations make it a must to collaboration on a high degree, where networking over R&D sites are considered as essential. Therefore, we have chosen to illuminate this question.

- *How often do you feel that you have a sufficiently large informal network outside your project line organisation (NW5)?*

Why NW5 were chosen of networks has a large impact on the current situation at AstraZeneca. As described by Teigland (2003), networking considers interaction between individuals when performing work tasks and is created informally. Interaction and collaboration on an informal basis is an essential component in how workers perform their work tasks. Davenport & Prusak (1998) advocates that a large amount of knowledge is passed through informal networks, across

networks and through communities of practice. These functions of networks must be facilitated if you are to manage knowledge. This item was not seen as problematic by the respondents, but we think in correspondence with Davenport & Prusak (1998) that networking constitutes an foundation of how knowledge and information is shared, that is why this item were chosen.

4.3 Qualitative data: Interviews

In this chapter we present the background to our interviews and the answers gained from the interviews.

4.3.1 Background

After analysing the answers from the survey some of the questions were considered more important than others. In order to get more in-dept answers to these questions and to our research questions; interviews were made with some of the users. We conducted these interviews based on the assumptions:

- To gain an understanding for how users gather and share information in the current information environment.
- The results of the interview would be of great benefit for our research in order to map out the need for information within projects. The projects have different needs; our aim was to focus on the most relevant information which would be essential for all projects.
- Comparing and verifying the theoretical knowledge management literature with the empirical data which is gained from these interviews.

4.3.2 Kind of information needed

Information that was needed varied depending on the individuals and their departmental belonging. The information needs, that were brought forward by almost all respondents during the interviews was the need for articles and journals that were found in different databases. This service, where you could have access through the intranet is something that has been of great benefit for many of the respondents. Data that could be found on shared file servers was also considered important, especially when working in projects situated in different countries. Project information that was posted locally on a specific project sites was also seen as important. This information, surrounding the project, was made available for specific individuals within the projects. E-mail that was posted from other co-workers and associates, to and by the respondents, was also seen as a source for information gathering.

Where this information could be needed was stressed by one respondent during one of the interviews:

> "[…] with the difficulties when developing products, with the immense demands from authorities [regulation of products] […].You have to have rapid access to that [project-related] information and utilize that information. In competition with other companies it could be very important. We are now building a data warehouse so that we easier can

manage the information that we gather during a projects lifetime. This information is then reused."

4.3.3 How the information currently is found and gathered

Asked of what kind of information needed one respondent answered comprehensively:

"I make a distinction between information and knowledge. Information is just something I have not taken a stand for. You have to process information before you turn it into knowledge and you cannot be sure even then that it is knowledge […] that is how I try to look at it. We have forums to discuss these kinds of things where someone reports [their findings]. The amount of time invested in a report is dependent on how good the process will be. Sometimes it is a conversation in the hallway, sometimes a meeting; sometimes it is a meeting where we have both representatives from Discovery and Development."

A common theme among the respondents was that a lot of information was gathered through their informal network. A lot of this information was derived through weekly meetings. The information was also gathered from other different sources; the organization has developed two standardized document system called GEL and PKT. In these areas the informal networks have had a great impact as well. When searching for information on websites where users are not accustomed with it, they rather not use the search tool; due it by many was considered as a terrible tool. The respondents would rather ask someone they know and gain the information that way. Many felt that there was not a tool good enough when searching on the intranet; therefore the informal networks were used. Ways of gathering information differed depending on the profession of the respondents. Common ways of searching for information outside the organization was mainly through electronic journals; this was made through an article search tool provided by the AstraZenecas's library. Critical voices that were heard against this kind of search tools were the multiplicity of documents found. When asked if retrieving information is easy a respondent answered:

"Not instantly, eventually I will retrieve it; all I have to do is to lift the phone and call a colleague and ask for the data for this, that and that. She will put it on our shared folder that is how we have built it now, an alternative environment to a data warehouse. We have shared servers here, there and everywhere."

One respondent who did not see any major problems with searching and finding information claimed, when asked if he ever lacked information:

"I believe that it depends very much on the personality [of people], I talk to pharmacology's at least ones a day, either I will go over there or they will come over here. I have never ever lacked the information that I need! It is more an issue of getting too much information. "

The main method for the respondents to receive information was through e-mail from co-workers and through meetings. E-mail was a method claimed by almost all respondents as one of the main contact channels to send and receive information. A major issue that was brought forward by all of the respondents was the amount of gathered information when searching for information or receiving information.

"Periodically we receive 50-60 e-mails! It is ridiculous to believe that […] you have to put a level on how much effort you should put in different things, and really work with what you really have to do! Often you just let it go [ignore e-mails], they will handle it,

and they [the sender] will come back. Yeah, thanks for your mail, I will come back to you even though you know that you will never do it!"

This was supported by another respondent who stated:
"Really, it is not a problem of retrieving or getting hold of information. You drown in it! It is the selection and to remember to value it all. But it is the selection that is the problem, to find in the noise [of information]."

When asked about how to sort in this noise, the same respondent continued:
"A counteraction [to the problem], it is too much out there so you take a step backwards and instead talk to people."

Meetings could be organized as scheduled meetings or just through meeting someone you know in the hallway. The majority of respondents brought forward the use of the internal document management systems GEL (Global Electronic Library) and PKT (Product Knowledge Transfer); the use and the common view of these systems varied.
"[…] Regarding documents we have GEL. It is a world class system but it has been very difficult to get there: there have been problems with the maintenance, organising and education, so it has been very difficult."

Those respondents who had daily contact with other sites around the world acknowledge that the information on a specific site was not easily retrieved. When asked of how information was gathered one respondent answered:
"First of all, what do I want? What do I want to know? After answering that, the situation of today is that the data that a statistician possesses can be gained through a personal contact. This generates a physical act or activity that ends with that I get the information I need. We cannot retrieve everything, if that is what you mean? It [information] lies on different islands. This kind of information could take not only hours to retrieve, but days."

4.3.4 How knowledge and information is shared

One way of sharing information was done through document systems.
"[…] Then we have GEL [document management system] we use it to share a lot of regulatory documents with our listed companies, and in PKT [document management system] we share everything. These are open for every listed company, so that all commercial material that is going to be used is collected there."

Another way of sharing information was through the intranet but this was not the best way to share; due to it being very difficult to retrieve information for users. The common view of the navigational structure is that it is too complicated and it is almost impossible to find information, if you are not accustomed to the site. Another respondent (Clinical Project Director) uttered:
"I have my team there [intranet] and links into the structure of the project. So there [on the intranet] I have the channels and links to PKT. In this way I have links out to the PKT. I never go straight into PKT and search, rather someone tells me where to find it and then I retrieve the information. "

Another of the respondents admittedly that some project-related information was gained through the intranet:

> "We use it [the intranet] within in the project; through the intranet we retrieve websites that we use in the project in order to gather information surrounding the project. But you could say that it [the intranet] is used is more as bulletin board."

Although, the most common way and of most value that was brought forward by the respondents, was that the informal networks were priceless when it comes to sharing information.

> "The most important information that you gain is the personal information, you know; from a contact network. You know which ways to go and it is much more effective than computer. You call and ask: it is that simple! Other types of information such as regulatory information that you know are going to authorities are gathered at one place [in document management systems]. Even if you do not know exactly what you are looking for; you know the structure and navigate through it: what kind of information am I looking for? This kind of information is starting to work well. "

Sharing information within projects was often done through a common website in the form of an intranet that was especially developed for the current project. Accessibility of these particular websites was for users within the project. Within the projects, project areas are used. A disk was created for every project which was divided between different functions. For users outside the local site global disks were opened so that e.g. USA or Japan can have access. These project areas were administrated individually, so you could give access to the users you believe should have access to it. There are two different levels of information within the global disks; the mid-level and the ground level that most users have. Depending on the level of authority you can read and do different things. This authority level was considered good according to one respondent:

> "You do not want all people to read all the details. If you do not understand the information then you should not be able to read it, instead it could only lead to misunderstandings [when interpretation of data is performed]."

The need of sharing information between Discovery and Development varied between the respondents. The main reason for the level of involvement was dependent on what phase an employee's project was in. Those from Development who worked with Discovery argued that OurDiscovery was more open than many other systems:

> "Discovery is more open if I have understood it correctly; you can find everything that is their principle."

Sharing of information was also done verbally, for example in meetings. Sharing of data between the two functions was an aspect that had been discussed before, but had not been carried out yet.

> "Concerning databases, we do not share anything in any way. We have the same kind of information [in Discovery and Development], we have talked about trying to uniform our data, but we have not taken it any further. I sometimes use OurDiscovery! But, I only know of it because I used to work with a colleague at Discovery who has the responsibility for it now, so that is why I know that it exists…otherwise, I would not have looked at it either."

Other ways of sharing information which have become more and more used lately is the video- and phone conferences.

> "We have had very effective phone conferences where we have managed to solve difficult issues […] but one should not underestimate the importance of meeting people though."

4.3.5   How the current fragmented intranet is used today

In general, the common response from the respondents was that the intranet contained too much information. Mainly it was used to gain general information, which many considered important in a social context; such as the menu in the in the restaurant, the gym schedule etc. News bulletins were also considered important and were read by all the respondents. The intranet was not deemed as mandatory for their daily work tasks by any of respondents, as one put it:

> "I actually need it to a modest degree in my work. On the other hand, some parts could be good. I mean, information can be divided into two parts: one contains more of administrative information. Like what came out today i.e. Helpdesk [helps users with technical problems] will have a lower service level, what food is served in the restaurant? The other part is a kind of internal PR device that gathers information surrounding projects such as when a respected doctor express an opinion on some matter. That is how it looks like in the current intranet, which we have locally here today. In principle, I never use the intranet to search for information that has to do with my role in the project, there is nothing there of that I can think of."

Another respondent stated when he was asked about how much information he collected from AstraZeneca's intranet:

> "You do not collect data that way, you collect it separately. It is posted up in the project area. The intranet for me is more like [general] information. Now, during the reorganization I gather the structure [the organizational schema] of what is going to happen so that I know what is going on."

The same view was shared by another respondent when asked about if the respondent searched for information on the intranet:

> "No… searching. When I do search for information it is just literature searches."   Many view the intranet as a way of just getting access to the journals through the internal system."

As one of the interviewees highlight, about the current intranet:

> "Before, just three or four years ago, the journals that we read were often put on circulation and it happened that they would be left lying somewhere. If you were number eight on that list it could take half a year before you got the journal. Now it takes a minute, which is a huge difference!"

Generally, the respondents that we talked to did not post information on the intranet themselves. Often, they had a secretary who posted the information for them. Those who often used to post information on the site for their project where other users knew where to find it, the so called project disk. The features on the intranet, currently used by users, were not many. Often, they just used the favourite folder in order to reach the most frequently used links.

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Navigational structures are something that varies from site to site, which can make it almost impossible to find specific information. As one respondent put it:

> "We have numbers on our products and you could learn those numbers such as: ZD0865. But what this product is and who works with the product was something that I was looking for several times last week. It is very difficult to find who works with them, I can find two individuals relatively easy [working on specific product]… yesterday I manage to find out what it was [product number] but that was only because I have worked within this area myself. Otherwise, I would never have found it! I knew where to go, but it took me almost ten pages on the intranet before I got there."

Relevance of information in the current intranet environment is high lightened by several respondents:

> "I do not know if this is specific for our organization or if the same problem occurs in other organizations. I know where information resides, but the information is not updated or the person that posted it has quit or moved somewhere else. So old information is left unguarded, I think that […] [we] are not good enough when clearing out old information. It would have made it much easier to find information. It would also make it more fun to search for information. "

Respondents were unanimous when claiming that it is very difficult for a new employee to navigate and find the relevant information. It takes time to know where the information lies.

> "I have grown up with this system. There were not so many computers then; it was relatively new when I started here in the beginning of the nineties. You learn little by little."

4.3.6 How the informal networks are built

> "[…] Networking is the corner stone for humans of the future, this organization has survived a vast amount of reorganizations, and it is probably due to the use of informal networks that it has been able to do that."

In summary, almost every interviewed respondent was in agreement that informal networks were deemed as a prerequisite and mandatory for performing their everyday work tasks, one respondent stated:

> "[…] Nowadays, the use of informal networks has a very penetrative power. Not just for organizations, but also for the society of today. Informal networks penetrate across countries, cultures and time zones."

The statement made by a "professional" can be seen as a description of how important the use and building of informal networks can be inside an organization. Everyone agreed on that informal networks are channels that employees build over time, through working in projects. The informal networks were not only restricted to one function within the organization or to a specific-related work task or site. The issue with informal networks, according to the respondents, was to capture an as broad array of contacts as possible.

> "Many of the contacts are people that you are closely related to, even if we do not belong to the same department or sit in the same corridor. It is good to nurture the relationship

with them you sit close to or say hello to on an occasional basis; you might be able to use them later on."

But still, one respondent saw a problem in informal networks that have been created over time. The respondent had been employed by the organization for many years and described that she had a large informal network, but there were risks in using the same informal network continuously:

> "It is easier to use it but at the same time it is a risk because the informal network is something that has been built up, and that is still developing, with people that you are currently working with - you might miss something of the new knowledge from young employees."

Almost every respondent stated that the use of informal networks was a channel to gather information. Often, other channels were labyrinths to navigate through. Examples of labyrinths were search engines that produced information overload and navigational structures that did not fulfil its purposes. While a "talk in the hallways" or a call to a companion within the organization was an easier way to get the right information and it spared time for the information seekers, as one respondent explains:

> "It deals pretty much with a talk in the hallways, you have a meeting and you sit down and talk after the meetings. We have a vast amount of telephone conferences and videoconferences so that we can get together as a team. But it is nevertheless when you sit together or eat lunch together that things are discussed."

The same respondent explicated that a "talk in the hallways could be seen as both a threat and a hinder to their work:

> "It is the talk in the hallways that constitutes the biggest problem, when we try to work globally. It is in the hallways that things [new initiatives] are constructed, I mean, it helps a lot if we know each other and you can dial their numbers, but this [informal meetings] constitutes the main hinder in the communication for us."

Another respondent stated when asked about how informal networks are used within his project:

> "The organizational structure of today might not facilitate this project. We have to be on our guard so that we can see that this model that our work originates from [how work is performed, through which methods] is established. It has been build up pretty much around networks, personal networks. It is not the organization that has given us the tools to start up this project; it is our own initiative - that is how it is today."

When it came to gathering information, the respondents knew which path they should take and who to contact to get information i.e. it was faster than using computers. One respondent advocated:

> "[…] Most [informal networks] builds around intrinsic knowledge, i.e. knowledge that is given to you by experience. I know the co-worker who knows the things I need to know […] You can get the exact same information through the use of other channels also, but it is ten times harder when you do not possess a strong informal network [...]"

The same respondent avowed:

> "I do not know how many Website we have in our project area, we talk hundreds and all have their own little touch on how to do things [Design of homepage and structure of

information]. Some homepages are updated once every six months, others are updated every day. In general, you cannot trust this information. If so, I got to learn in some way or another what every web site consists of in order to proceed with my work and it takes too much time. I mean, I take the easy way; I call the person I know has the answer to my question."

The contact and nurturing of informal networks was primarily done, on basis of all interviews, through telephone calls, meetings and e-mails.

"In our current project we meet up on a regular basis, once a week we have a face-to-face meeting. We also use daily e-mail contacts."

The usage of face-to-face meetings and discussions were slightly different between the asked respondents. The main issue, when it came to face-to-face, was the respondent's perception of whether they liked to see the person they talked to or they preferred to do their contacts by e-mail or with other media. Also, it was dependent on which function and area they worked in. One respondent explicated that all of his co-workers was situated merely 50 meters from each other, which made it easy for him to go over to them and discuss problems.

"I prefer to talk to people […] For me it is really important. I think that nuances of the conversation are missed if it is not performed face-to-face. Often, it is easier [face-to-face] to come to a conclusion and make decisions faster. When e-mailing, the same decision has to be processed 20-30 times, which can make the whole thing unbearable."

The use of informal networks was not only tied to people within the organization. The respondents were not in the same agreement of using informal networks outside of the organization; some of the respondents had and used continually their external sources. The interviewees that did not have external sources stated that they used external sources from other sites, within the organization, or project members from other function than their own. When collaboration was done between different functions in large projects one respondent uttered:

"I think it [collaboration over the large global project] works fine, but I think it on a high degree is constituted on a person-to-person contact, I never go over to our co-function to look what they are doing."

The same respondent explained the usage of people from other functions to supplement work with regulatory issues, while another respondent explicated the usage of external consult that helped and provided him with target-specific information that was needed in his job.

Another factor stated as being an advantage, brought to light from interviews, of using informal networks is that you can trust the one you communicate with because a level of trustiness has arisen between the parts e.g. through working together on previous assignments. Often, informal networks are built upon networking in other projects and getting to know as much people as possible that can be of help in the future. When a new contact has been established and mutual sharing has begun, a level of trust between the parts is established i.e. the sender can trust that the receiver do not forward the information and the receiver knows that the sender's information is up-to-date. As a consequence, the involved parties know what they get when they send or receive

information. On the contrary, when using information technology and help systems such as a portal it was avowed:

> "[…] You wonder a little if these web-sites and portals will work, because this other system [informal networks] works good and in this system I know who I can trust and that he or she can trust me, that is why they share information. If an open solution [collaboration tool open for everyone] is introduced, you do not know who is watching your information or who shares it. Do I know this person? Do I know this persons perspective on things? You loose the whole human thing."

This kind of statements could be found throughout a large amount of the done interviews i.e. that in order to share information mutually a foundational stage of trustiness had to be built up between the two parts. Other quotations related to information technology were that in the end all comes down talking to people and nursing the informal network:

> "All glory to portals and so on, but it all comes down to talking to each other."

Another respondent stated:

> "This is human relationships […] All glory to data sharing, but it deals with human relationships one way or another."

4.3.7   The impact of culture differences

Almost all interviewees stated that the largest barrier of working across boundaries with co-workers, on a global level, was the language. The language can be a large setback for those who do not master it or do not have the language as their mother tongue:

> "[…] We tend to be stupid because of the language; it does not sound so good even if you are good at it. You are always a looser when you enter a discussion [...] you are the underdog when there are eight Americans and one lonely Swede [in a meeting]."

Many of the respondents were in agreement that the matter of meeting people on a continuously basis was highly valuated when it comes to overcoming the language barrier. One respondent declared:

> "There is a risk for the organization that you do not meet face-to-face; it works over telephone when you know who you are talking to. I mean, if you come in new or change project or when you should collaborate on something new, where people have not really met face-to-face and English is not your mother tongue, the effect will be that you loose nuances."

More factors that affect how collaboration across boundaries is constituted are geographical misplacement and cultural diversities. When it comes to geographical misplacement one respondent declared:

> "It is a problem, even in England. Parts of the core team of the project I am working in are situated in three different countries. It is a problem, the information sharing has to 90 percent been done through e-mail, and this is not good. A vast amount of the information sharing is also done through telephone and videoconferences, but it is as far from as good as I want it to be. When the management [of AstraZeneca] distributed the project in this way they missed a part - what effects it would bring if you split up a project - you loose the human and personal contact […] There are a component in it that makes it sub-effective and you sub-optimise it when you split projects in this way. People are geographically misplaced [within the project]."

Another respondent stated that there were not any problems with having the core group situated in three different countries; the respondent declared that it works surprisingly well, even if the project were very complex.

The perception of cultural diversities, when it comes to information sharing, differs between the respondents. On one hand, a few respondents stated that there were no problems with the willingness to share information. One respondent stated:

> "There are no direct difference between the willingness of sharing information, it is the probably more the degree of consciousness [among employees] that decides whether you have to share or not."

On the other hand, several other respondents had noticed the concern of unwillingness to share information within the organization, when asked about if they felt any problems with withholding of information it was urged:

> "To a certain degree we notice that it is a problem [of sharing information] from USA's point of view. USA has a different situation in this case, because they are a listed company, but at the same time they are to a high degree involved in the global discussions [concerning project and products] as well. I mean, they have to discuss their standpoint and what they think within USA. Therefore, they might not share it as open with us. This is the case for all listed companies [that the organization consists of]. It is only because we work so closely with USA that we have noticed that they are withholding information. They have a difficult role, they are protecting their market and at the same time they are trying to have global roles within the organization […] But I am convinced that they feel the same way about us."

When it comes to the cultural climate of sharing information, the interviewees were in conformity, one explicated:

> "I think there is a more open climate in Sweden [Swedish sites], I am not so deeply involved in the [organization's] research in England, but I am afraid they protect their territory more [withholding of information]. There is a very open climate in Sweden [Swedish sites]; the sharing of knowledge works well."

When asked why the climate was more open in Sweden another respondent supplemented with:

> "[…] it is possible that we give good feedback; those who work here [Sweden] can see where we stand and what we are doing at the moment [in the project]."

The subjacent cause for different climate was explained by one interview as:

> "It is probably because we [in Sweden] work in a line organization while USA has a more of a project organization, but then they do not work [collaborate and share information] as much with us, only among themselves - that is how I experience it."

4.3.8   Needs and requirements for information sharing

Needs and requirements for information sharing brought up by interviewees showed a very versatile assortment of demands. Their needs were in some cases similar, such as a new navigational structure and better searching. Nowadays, navigational structures within

the organization's intranet were too confusing and did not fulfil their purpose. One respondent declared structures of different function as:

> "Often you build up too many structures [navigational structures and structures of information] that are crystal clear for anyone that comes from that function, but when you come from another function and use their structure you do not understand that function's structure at all."

It was also stated that culture had impact on how information was structured and how navigational structures were designed:

> "In this organization we have cultural structures [on information and design of navigational structure] – what an English employee regards as very structured [in terms of information and navigational structures] we [in Sweden] experience as very non-structured."

The issue of implementing better search engines was also supported throughout the executed interviews:

> "[…] A form of search engine so that you know whom to contact when you are interested in a specific product. Who works there [in the particular department that the employee needs to know of]? […] I like to talk to people I know and therefore I would like to look into that [specific] team for someone I know, in this case I knew the director [of the department], but how about when I cannot find the information anywhere? It is probably there, but I cannot find it! It would have been nice to be able to search for a specific person in a specific project."

One respondent urged for basic training of new solution, because users did not know how to use them.

> "[…] One thing that often is missed is that you forget the general training of people. A selective education is often used [i.e. when] a new portal has been implemented; what benefits does it offer? Go and learn!"

Many respondents advocated that the current environment was too fragmented and it was too hard to find what they were looking for.

> "It is a bit of a shame that there is no one that could sift the relevancy of information. You do not even look at much of the information that circulates [among employees] because it does not concern your interest area."

Another respondent saw the same problem with too much distributed information and explained:

> "[…] What would have been of great benefit, since there are many homepages that you are interested in, is personalization of interesting homepages so that you would be able to see them every morning when you start up your computer. "

The necessity of using a uniform structure to bring all functions together and to provide a channel that everybody could use without being hindered by visual layout and structure of information and data was brought to light by interviewees:

> "I get a feeling that we do not spend much time structuring and making things [structure of information/data and navigational structure] on the site visible today. There is no distinct policy [for how to structure it], different sites do it in different ways and it is not done with the same frequency and so on."

Another respondent had a similar explanation to the same problem:

> "[…] If only a co-ordination of these [dispersed] systems could be delivered i.e. to provide just one [information and data] structure, a global structure, that can show how all information should be compiled and delivered. This would result a minimization of current distributed systems […] If the same structure is used, it is irrelevant if I go into the system here or there, one would recognize how to get there and it would be self-explanatory how to get where you want to go […]"

Further, one respondent uttered:

> "[…] Of course, some insights of graphical incitements is good [on homepages] so that you know where you are and so that you are not lost in the labyrinths of homepages, but sometimes it is too much […]"

When structuring project-specific information one interviewee claimed:

> "I feel like there are an aversion towards structuring project-specific information [within the project] and towards writing it down so that we can take it into mind, through reading a specific document. It is much easier [for information owners] to deliver five bullets in a PowerPoint-file and speak about it on a meeting."

Other aspects brought to light on how to uniform data and information was to uniform the information in such a way as one of the current document management system, GEL.

> "When it comes to documents we have come a bit on the way, it seems that it begins to be established […] On the basis of [current document management system] GEL we would like, when it comes to data, to transfer the same ground principles to it."

He also stated that in the current situation they do not have any experience in making data uniform.

> "I think that we are a bit on the way, we have looked at how GEL works and applied the same activities, the same environment and the same perception on data. Then we would have a dataGEL and a documentGEL. I think this is the future, but the data part can be more sensitive when it comes to who should be able do what [with distributed information and data] […] This is very sensitive, we do not have experience of it, but we are considering on how to solve it [future data management system] […]"

One respondent who was more accommodated in technical aspects stated, when asked about if it would be interesting with a new more updated and bigger system, portal alike:

> "Yes it would be interesting [with a portal]. What I miss the most is that we do not possess any intranet that is more regulated by user so that you can control visibility of information. I do not talk about writing and reading; I really mean the issue of users being able to see the information at all. If the users do not have authority – they should not be able to see it [information]."

The respondent was highly inclined with authority control for visibility of information and claimed that if everybody could see the information the control over your own produced information was lost.

The same interviewee also addressed the issue of uniting different dispersed groups of project members. The respondent asserted that the best way of finding a solution to the

problem that cross-boundary collaboration bring is to situate the core group of a project in one location, and not just look at information sharing as a technical process. But the issue of gathering every one at the same location was physically and geographically impossible; the interviewee stated:

> "There is no possibility to have all R&D-people on our site. Therefore, we have to find other solutions that can help us, but when it comes to technical issues we have to have a system where you can trust the relevancy of information and that it contains high quality [information and data]. I need to know who produced it and in some way or another get a level of trustiness to that person. I do not know how to do it, but if it should contain more than just text we must change our [the organization's] perception of information sharing radically."

The respondent also stated that it was necessary to open up networks that are working. Networks should not be forced upon users then, as respondent stated; it will not have any good effects on information sharing.

5 Discussion

In this chapter we discuss our findings from the theoretical chapter as well as from the empirical chapter. These findings are discussed in the light of our purpose and research questions. Our discussion lays as a foundation for the conclusions presented in chapter six. In further research, which concludes this chapter, we propose aspects of our study that could be interesting for further research. What should be noted is that all interviewed respondents were Swedish, which can have the effect that the problems brought up here might not be seen as problems for e.g. British and American employees. The discussion is divided into four parts: findings from the qualitative study, findings from the quantitative study, limitations and further research and implication for managers. When analysing results from the qualitative and quantitative study there is a consensus surrounding the areas that we have studied. The studies are woven into each other and add different aspects to the discussion.

5.1 *Findings from the qualitative study*

This subchapter is divided into five parts: *cultural differences, informal networks, difficulties when searching for information, users and design* and *privacy and authority control*. These five parts were deemed as the most important when considering the results and findings from the above-mentioned chapters. We studied five parts to get an understanding of how a portal should be designed i.e. every part of this chapter will conclude in an analysis on what effects the part could have on a design of a portal.

5.1.1 Cultural differences

Language is considered by many interviewed respondents at the Swedish R&D site in Mölndal as a barrier when working in a global environment. Especially when you do not master it and it is not your mother tongue. It could be difficult when trying to get your point of view through to other co-workers. As described by the interviewees', Swedish employees tend to be under a lot of pressure when entering a meeting or having a discussion with American or English colleagues. Even though the respondents that we interviewed considered themselves speaking good English, they considered the language being a barrier. English is the official corporate language at AstraZeneca. The barrier of language is something that is brought up in chapter three where it is argued that worldwide views and languages can be a hinder for groups that work towards mutual goals and solutions. Consequences could be that the new products arrive on the market too late or that costs for at projects increases. Our view is that it is inevitable for large corporation to have one single corporate language: there are no other ways of doing it. The language is something that is more up to the individual; to either try to improve their English language skills or be better prepared when they come to meetings. This was something that was pointed out by interviewees when dealing with this kind of situations: preparation is the key to success.

As argued in the information sharing chapter, it is more likely that information sharing exists between individuals that hold stronger bonds to each other. It is also argued that, when sharing information, there need to be a reciprocation and interaction between the

parts involved in the process. Therefore, some kind of interaction should exist in order for individuals to reconcile their position. Electronic media does not only contain advantages; this is something that is high lightened in the theory section as well as in the empirical results. Especially when creating a new project or collaborating on something new. You miss nuances and other important aspects of a conversation if you do not meet people and just use the technology e.g. face expressions and the tone of voice. In the empirical chapter one could also read that the issue of sharing information within the global organization was hampered by restrictions on certain sites, for example restrictions of sharing information because the company was listed. Conformity, among the Swedish respondents, was also acknowledged surrounding the issue of cultural climate within the organization; the cultures within the sites in Sweden were considered more open than in other countries that AstraZeneca operates in, according to the respondents.

Even though the best solution would have been to have all functions within a project situated in the same area this may not be possible; knowledge is often dispersed between other countries in a large organization. What should be pointed out is that our findings in the empirical chapter showed that the respondents who were most satisfied with the current information sharing environment within the organization, were the ones who had most of their project members situated nearby. But as described in the collaboration subsection in chapter three, the pressure from the market and the ever-growing need to share information has made it more important for organization to share information. It is also high lightened that the distances and separation decreases the chance for users to meet face to face. Further on, we point out, in the collaboration section, that personality barriers, physical barriers and divergent cultural worldviews play a significant roll and hinder collaboration across boundaries. Kahn's (1996) study concludes that through the interdepartmental integration the organization can co-locate groups with dispersed knowledge resources. Interaction is vital as an encouragement for performance and collaboration; it acts as a balancing medium within the organization. Even though the distances between different functions within a project are obvious, there are nowadays techniques for overcoming these hinders i.e. video- and phone conferences. These techniques were often used successfully within the organization but as brought forward in the interviews they cannot fully replace the face-to-face meetings.

In order to support knowledge creation it is argued in chapter three that you need a healthy and supportive environment: therefore the information culture is brought forward. An ability to transfer and access information is not solely sufficient to ensure success. One should not, as argued further on in the chapter, have an over belief in technology: there is a balance that should be taken into consideration. What is stressed in chapter three is that the most information-oriented companies are the least likely to share information freely. Further, it is argued in chapter three that the unique information that people hold defines their job and it could therefore be a legitimate reason for withholding information. Our research shows that on a local level the information is shared freely, but on a global level this is not the case. Our research is supported by the results conducted by Detlor (2004a); in his research he concludes that: information is more likely to be shared when access was predefined to specific users. A reason for not sharing information or knowledge could be that it contains too high personal value.

So how will the cultural differences affect users when implementing a portal? As argued in chapter three, organizations that have a positive social interaction culture will socialize more extensively i.e. management and user exchange information and interact on a higher degree. Organizations that promote behaviour where individuals work on their own will more likely struggle with the issue of sharing information.

Conclusions which could be drawn from cultural differences are that; where the different divisions of the organization are situated is of significance. Also, knowing the one you share the information with and gain information from is of importance in order to estimate the value of the information; the structure of the organization is important when sharing information i.e. if it is practiced or not to share information. Information sharing within an organization can, as argued in chapter three, be promoted through the cultural norms within the organization. Using a portal in order to encourage collaboration could be a complement to the current usage of informal networks. The role of the portal is to connect people as described by Siviter et al. (1997), but a portal is more of a virtual collaboration level that exists in order to connect different departments in an organization. In a project this could be of significant value, as a portal would work as "time free zone"; nobody has to take time into consideration or other such aspects within an organization. Therefore we believe that the cultural differences that exist within the organization we have studied could be reduced with the help of a portal.

5.1.2   Informal networks

Shown throughout the empirical study, the importance of having a well-established informal network was stated by all respondents. Also, as described earlier, some stated that it all comes down to talking to people within the organization, which points out the importance of having a large informal network, if the users should be able to find information that they need quickly. This also indicates that employees prefer to talk to each other rather than using information technology to perform their work tasks. As explained in the portal adoption and use chapter, perceived ease of use and perceived usefulness are vital factors for an information technology to be adopted into users work task. The current situation at AstraZeneca is not entirely "user friendly", as stated in interviews; it consists of a fragmented environment of homepages. This implies, from our point of view, that users tend to use the easiest channel i.e. they contact someone who knows what they need to know. In order for a portal initiative to succeed there is a need to utilize the current ways of communicating with informal networks i.e. the portal must consist of facilitation techniques that support informal networks. Therefore, we can see a need to put ease of use and usefulness in the centre of attention so that the portal, at an initial stage, is easy to navigate so that employees not only use their current ways of communicating i.e. telephone, meetings etc. Instead, the portal should be seen as another channel to exchange information with the employee's informal network.

Why is the social tie so important for employees within the organization? From our point of view, the corner-stone to why social ties and face-to-face contacts are so important is because human-beings are, in nature, social animals that need to use all channels, when discussing and solving problems in order to be able to come to a consensus. If the social

ties should be drawn to a point where the information technology is the mediator between users; the issue of using all channels is lost i.e. to feel, look, hear etc, no new information technology can solve that problem, but it can to some degree facilitate it. Facilitation techniques could be usage of videoconferences and telephone conferences to complement face-to-face meetings, so that the project can come together as a team, this approach was stated by one of the respondents.

Informal networking was constituted throughout the organization despite what Griffin & Hauser (1996) stated in the collaboration across boundaries chapter about physical barriers. It was stated that dispersed groups made it very hard to meet face-to-face and to foster informal networking. In our observation, informal networking was constituted despite physical boundaries; there were ways of communicating other than face-to-face contact. Respondents had contacts spread out through the world with which they informally shared and gathered information, on a regular basis. Certainly, gathering all colleagues at one place would have been good for informal networks, but not a necessary requirement.

The issue of describing why users tend to prefer to meet face-to-face can be summarized in what is described in the information sharing chapter i.e. social ties and bonds among users will enhance the willingness to collaborate and share information. This means that users need to have some sort of connection to the person that they are talking to. The empirical study stated that collaboration and information sharing could only be constituted between people who have social ties and feel strong bonds to each other. The implication can be that users opt to use their "traditional way" of doing things where they get relevant information and at the same time nurture their informal network to keep their sources to information. Therefore, information technology should not be seen as the only solution to make people share information more or collaborate on a higher degree. Instead portals should, from our view, be seen as an entry point to the usage of sharing and collaboration tools. Davenport & Prusak (1998) argues in the information culture chapter, that no information technology is sufficient to enable free flow information throughout the organization. In accordance, Igbaria (1999) explicate in collaboration chapter that technology should be seen as an enabler not the solution to collaboration. Detlor (2004a) advocate in his study, described in the framework chapter, that portals can influence information behaviours of users and potentially alter the environment. Also, described in the portal chapter, Detlor (2004a) avows that a portal allows users to be more knowledgeable and signal the potential value of information to users. Davenport & Prusak's (1998), Igbaria's (1999) and Deltor's (2004) arguments indicate that information technology can be a complement to what we saw as a problem i.e. the tendency of people choosing the easiest way to communicate, informal networks, and thereby use the new portal as a complement to their already established informal network.

What can be done to augment the usage of portals? We can see that a shift in authority control and information politics has to be established within the portal in order to change focus from other ways of communicating with informal networks than the portal. In the current situation, the control over information is finite i.e. information is not uniformly controlled. Users do tend in some degrees to use the ideology of anarchism, as explained

by Davenport et al. (1992) in the information politics chapter, whereas users manage their own information on their own peril. Anarchism will bring more dispersed information sources and will not foster, from our standpoint, collaboration and information sharing. It can be stated as "If we only knew what we knew" and by using an anarchistic ideology the unconsciousness of what the organization knows increases. It should be stated that not all respondents used anarchism; federalism was in some degrees used whereas negotiation and exchange of information were done on the consensus of both involved parties. Monarchism or federalism, explained by Davenport in information politics chapter, would be structures that the organization has to strive for. Davenport explains that these two ideologies are best suited for organization, but sometimes monarchism is easier for organizations to implement. What this implies for the portal implementation is that AstraZeneca needs to take a step backwards from that we perceived as critical i.e. that there are tendencies to anarchism within AstraZeneca. AstraZeneca need to have clear guiding principles on how to control the information. A level of administration has to be found were everything is regulated from a monarchist or a federalist point of view e.g. where one person is in charge of all generated and shared information within e.g. an discussion board.

It was also commented among interviewed respondents that informal networks were used as another way of finding information. The use of contacts is indeed good, when it comes to gathering information from the current situation in the organization, if the user has a well-established informal network. New employees do not have the same starting position, which can constitute a large problem for the organization. An effect of not being able to find the right information quickly, not knowing who to ask when the information is needed, could generate costly time losses for both the employee and the organization itself. Another effect that this phenomenon can bring is that new experience is missed, because of well-established informal networks. As argued by the respondents, there is a risk using the old built up informal network because new knowledge and experience from young employees could be missed. In today's situation in the organization, we believe that informal networks constitute the foundation of how work is performed. One respondent stated that initiatives to projects were not made by the organization, but instead the solidity of people knowing each other were the prime factor to that new initiatives and projects were built.

What does this imply for the organization? When considering a portal, we think that a transition from a fragmented intranet environment to a uniform portal will in small dimensions affect the usage of the current way to communicate with informal networks where shared information is not codified in any way. When shared information is not codified the organization lives under the maxim of "If we only know what we know". A portal has a better potential to gather and codify information that is shared through informal networks. When considering the current situation, users show scepticism towards new solutions. We think that the current way of communicating i.e. through telephone, talk in the hallways or informal meetings will dominate over the usage of the portal to diversify and share information. However, this should not be seen as a defeat for the portal. Instead the organization should concentrate on making it clear for the users that there is another channel, except telephone, meetings or a talk in the hallways, for

communication that diversifies information to larger masses of employees. Other advantages are that a portal for informal networking makes employees work task more efficient, work tasks that otherwise had been hard to accomplish. This concerns e.g. involvement of a whole group of people where the information can be shared behind closed doors, just like with telephone or a talk in the hallways. Instead of spreading the information from person-to-person employees could, with the help of the portal, spread the information from person-to-many persons at the same time. Although, this could be done through the use of e-mail as well, portals could be used to direct the information to specific users in a more advanced way.

We think that a portal implementation might integrate new employees into informal networks from the start. The reason why an integration of new employees with the help of a portal would be better suited for introducing employees into informal networks is because of when a portal is used, an employee can distribute experience that can be of value to a large mass of co-workers. On the other hand, a traditional way of communicating with informal networks will use the snowball effect, i.e. the information is sent to one person that recognizes the value in the information and in turn spread the words to e.g. his informal network that in turn contacts the originator of the information. This is one way that an informal network can be established. In portals the snowball effect becomes bigger where small snowballs grows bigger and at the end trigger avalanches i.e. the message of that a new employee possess valuable information is spread to a large group of people that in turn spread the message around to e.g. their informal networks. It is much easier, but the question is if users, other than new employees and highly interested employees in the organization, are keen on loosening their current ways of communicating with informal networks and instead communicate through a new information technology?

5.1.3 Difficulties when searching for information

In chapter three a distinction is made between searching and browsing: when searching users know exactly what they are looking for. Browsing on the other hand is when users look for information and rely on serendipitous findings.

As described in the problem area, the current situation at AstraZeneca is an environment with a large number of fragmented intranet sites. This is also the main reason for difficulties when searching and browsing for information. Our empirical study shows distrust for the current system, due to the fact that when users browse on sites that they are not familiar with; it becomes almost impossible for them to find the information that they are looking for. This is a situation that is not tolerable in an organization nowadays: you cannot expect users to spend a huge amount of their time browsing for information. In labyrinths of information, it can be very difficult to find ways to available information; it can be very frustrating for anyone to search for information. In the empirical study users revealed that they could actually be searching for information during an entire day, which is not acceptable. Searching for information is something that also was brought forward in the theoretical chapter. We highlighted different factors that inflict users' ability to search information; perceived benefits of search, ability to search and perceived cost for using the search tool. As brought forward in the theoretical area the key factors to

find desired information were: browsing features, search assistance and relevant feedback. When analysing the results from the interviews, it was clear that searching was an important area for the users and they stated that if there had been a more effective tool for searching, they would have used it a lot more. We believe that that the most effective way is to move away from browsing and instead develop search tools that are more user-friendly.

The searching factor was not the only factor brought forward as a problem when searching for information; the navigational factor when browsing was another one. The benefits of having a good navigational structure when browsing cannot be stressed enough. In our study, the participants of the interviews pointed out that the structure in the many different intranet sites varied so much that they needed to have a trained eye in order to understand the structure of a specific site. There was a unanimous request for a navigational structure that did not vary so much. This is of course not easily done; issues such as whose navigational structure should be used, how often the structure should be updated and so on are issues that are not easily solved. Some sites contained animation and other paraphernalia that were not of interest for the users, instead they acted as a distraction. Previous experience and training is of certain importance in order to find out how users will adopt to a new environment. Of course, the more you work with a system or with a site; the more you get accustomed to it and the better you understand it. But what also should be considered is the amount of time that would be saved if there was a uniform navigational structure. A portal could in this area be the navigational structure that the users crave for. Our view is that the portal represents both personalization and has a uniform navigational structure. Especially as it can be personalized for the specific user needs and provide the user with information that is suited for their daily work tasks. With personalization, in this area, we mean the way the information is presented to the users and how the portal could highlight information that is of importance for them.

Personalization can also be a tool for avoiding information overload, which was a source of problem for all users that we interviewed. Almost all of the users complained that they were exposed to so much information that was not deemed as mandatory for work tasks. The issue of information overload is not something that automatically is solved when implementing a portal. As argued in chapter three; the portal can be a tool for this and it can be used to support this area: it could be used to provide users with a single gateway to personalized information that is needed in order to make the right business decisions. With the portal users will be able to find, extract, and analyse information in the most various forms. But in order to reduce information overload there need to be a strong identity management along with role-based customisation and personalization. As argued in chapter 3.2.2 users would interact with information tailored to their jobs through data fed from a legacy database; content- or document management system; a portal; or a new internet-based application.

During the interviews, we could sense that there was scepticism towards new technology; many of those that were interviewed had experiences of previous information systems that had not had the impact that was expected of them. This is something that organizations implementing a new portal should take notice of. The success of the portal

is dependent on the use of it; otherwise you risk having a superb system that nobody uses because no one knows of it or do not understand it to the fullest extent. What we mean is that there are many factors that come into consideration when valuating the success of a portal that are not easily predicted. End-user training whereas employees can learn to use and witness the benefits of the portal is therefore considered as very important especially in order to put the users in the right frame of mind when working with it.

5.1.4   Users and design

The issue of implementing a new portal, by just delivering the technical platform, in hope of that all users adopt it is unrealistic. Significant efforts have to be made in order for employees to adopt a new solution. As described in the portal adoption and use chapter, users adopt new solution on the basis of what functions the system consists of and if the solution is helpful in their every day work tasks. To draw parallels from our empirical studies, it was found that users where not pleased with the current way of handling or structuring information. This urge for a change, which the portal might bring. Decision-makers for the new portal initiative should make sure that users' views are considered.

Participatory design should be considered when implementing a new portal. The chapter of participatory design suggest that users should be a part of defining needs, evaluation of used techniques and constructing prototypes. Admittedly, the issue of involving a large amount of employees in the process is too complex and too time demanding. Instead, an organization should involve a few representatives from each function to be a part in the process. In our case, the issue of uniting two co-functions could involve, say, two to four representatives from each function. Often, representatives know what employees think about the current system and what they miss about it; these questions are often discussed in the hallways. Involvement in the implementation stages must involve users so that their views are expressed. Involvement of users will according to us increase the probability of adopting the new portal initiative.

5.1.5   Privacy and authority control

As explained in the empirical study, one respondent urged for a new portal that could possess regulation of visibility of information and authority control on whether users should be able to see the information or not. As found out, information sharing could in some cases be a delicate matter. This statement is in accordance to what Detlor (2004a) defines in the information politics chapter i.e. many users are more willing to share information if information is restricted to predefined individuals only. The statement was given from only one respondent out of eight, but Detlor's (2004a) statement above fortifies the usage of authority control. It is described in the personalization and customisation section that organizations should establish private data strategies so that data can be protected from being visible for "the public" (Aneja, 2000). Even though not every one stated authority control as important, we think that it has to be taken into consideration by organizations when implementing a portal. Without authority control, the issue of ensuring privacy and certification of strategies for users will be lost. We believe that authority control will decrease the ability to be anonymous i.e. in order to provide authority control the user that should be able to see the information must be known in advance. Implications when not providing users to discuss anonymously is,

according to Miranda & Saunders (2003) in the information sharing chapter, that the breadth of discussion made by users may decrease as well as the information overload will diminish.

5.2   Findings from the quantitative study

This subchapter is divided into three parts: *working environment, information sharing* and *networking*. These parts were deemed as important as argued in the empirical study (see chapter 4.3).

5.2.1   Working environment

R&D Mölndals answers differ in some areas within working environment. Users at the Mölndal site read more valuable information for their daily work than the rest of the world. This is shown in figure 8 (p.36) in question "Value of intranet on daily basis (P3)". Even though the users at the Mölndal site are not satisfied according to C13 it is significantly better than the rest of the world. The reason for this could be that the Mölndal site has come a bit further in this area than the other sites. This was also argued in our qualitative finding where several users claimed that the first page of the intranet site MOLNet was good with the links to e.g. restaurant menu and leisure & unions. What should be pointed out is however that our findings in the qualitative study show that users do not consider the current intranet being of great value for their daily work.

Question "IT environment & contribution to info. Sharing in projects (P5)" and "IT environment & contribution to collaboration with colleagues (P6)" (p. 36) shows that the users at the Mölndal site do not consider the current intranet usage as being sufficient enough in order to collaborate with colleagues in projects. Overall, this is something that generally is considered as a problem within the organization, it is however of a significantly higher at Mölndal than the rest of the world. The need for an easy tool for collaboration for users' could therefore considerably increase the level of collaboration within the projects. In our qualitative study a need for collaboration tool was also brought forward by interviewees; especially those who had projects that were dispersed over different countries. Within AstraZeneca, there are projects that involve cross-boundary collaboration; there is a need to standardize data so that it could be easily understood. This standardization concerns clinical data and the objective is to standardize this data in the same way as with the documents systems GEL and PKT.

Searching for internal information was something that was considered unsatisfied by all users in the survey, which is indicated in question "IT environment & acceptable search-time (P7)" and "Frustration over non-available information (P16)" in figure 8 (p. 36). This was also something that was confirmed by all our respondents in the qualitative study. There is a growing frustration when it comes to the amount of time it takes to search for the information. We believe that this could be the reason for users to have sceptical view of the implementation of another information system. Asking for information was not something that was considered as a big issue in the survey. As pointed out in the empirical study, the value of the C13 was not considered high in "Ask for access to project-related information within projects (P13)" (p. 36), but was still considered as an interesting question. Users did have problem with it though, especially

as argued above when working with projects in other countries. However, there was not a problem with retrieving information when employees asked for it.

5.2.2   Information sharing

Within the area of information sharing the results of how users have answered at R&D Mölndal are more or less the same as the rest of the world. A question that is of significant high value compared to the rest of the questions in this area is "info. sharing in project between R&D sites (IS5)" (p. 36), which is problematic according to C13. This area needs to be dealt with due to it being deemed as problematic at all sites. Sharing of internal scientific information is something that currently is not working so well within projects, which also is supported by the high value of the item "IT software solution & enable info. sharing between projects (IS6)" (p. 36). The reason for this could be that the information is not standardized; this is something that the organization is working on, as mentioned above in the working environment section. Our qualitative study showed that the ways of sharing reports was done through the document systems PKT and GEL; how these were viewed varied significantly between users. Other ways of sharing reports and primary data was through the intranet; this was not a popular way of sharing due to it being very difficult to retrieve for the users. The question "Info. sharing of own created information or knowledge informally (IS7)" (p. 36) is an area that we believe should be prioritized. This area was seen as satisfactory and calls for along term need for a change, according to C13. Sharing of knowledge and information has always been a discussed and this not something that is easily solved. Our qualitative study shows that the respondents rather share information to predefined co-workers and to someone they have personal contact with before. This is not something that is unique for AstraZeneca; it is observed in the information sharing chapter as well.

Using a portal could be seen as a complement for sharing information; both reports and primary data. There is a need from the users' point of view to have a coherent way of both retrieving and posting this kind of information. A portal could be used as a bridge in order to gain a coherent view. As brought up by many of our respondents in Mölndal, the structure of many of the websites that are used in order to retrieve information varied so much making it almost impossible to find the information.

5.2.3   Informal Networking

The result between R&D Mölndal's answers contra the whole organizations answers differs, there are diversities in how these questions are interpreted. One of the main reasons to why these answers can differ in "intranets contribution to networking (NW6)" (figure 8, p. 36) is because different sites within the organization uses different intranets e.g. Discovery uses intranets and homepages that current users situated at Development do not have access to. This implies that the offering is bounded to the function the employee belongs to. The qualitative study implies that that there is no direct "open structure" or "open entry points" for employees on where they can find desirable information in current structure at AstraZeneca. With open entry points and open structures we mean that there are no clear ways finding out what Discovery or Development are working on. Employees situated at Discovery do not know what workers at Development do; the exchange of information can be explained as inadequate.

Answers in "Having a sufficient large network (NW5)" (figure 8, p. 36) indicate that employees regarded the issue of not having a sufficient large network as a problem on the R&D site in Mölndal. As described in our qualitative empirical study, the current situation at AstraZeneca is strongly aligned towards networking and therefore a sufficiently large network is a must to be able to perform work tasks. If not a large network is provided it becomes harder for a single employee to perform their everyday work tasks and therefore time is spilled for the overall organization. Our arguments in the qualitative empirical study about informal networks can therefore be fortified through the quantitative study, where the same result of having a large informal network is given. The qualitative study suggests that having a large informal network leads to:

- Less work to get specific information
- The information is verified because sender and the receiver trust each other
- There is social relationship involved between the parts, which utilize information sharing.

The qualitative study implies, in large proportions, the same result as the quantitative study where respondents saw the strength of having a large informal network. But in the same time these informal networks, among the respondents, were in the current situation too small in order to fully facilitate their work tasks. The question "Networking between R&D sites (NW2)" (figure 8, p. 36) does in some cases imply the same result, where intranets and portals have not fully provided them with tools to supply their current way of working. Current situation demands high levels of networking activities, which have not yet been utilized within AstraZeneca. Also, the item implies that new collaboration capabilities has to be provided in order to supplement work between R&D sites, in this case the functions Discovery and Development. Through findings in the qualitative study, we have seen that collaboration is promoted on a global level through the use of document management systems, such as GEL and PKT. These do not support all involved parties at AstraZeneca. Often, as our qualitative study describes, these systems do not provide users with information necessary to their work tasks. Therefore, a portal can be seen as a necessary medium to bring together Discovery and Development and the employees within the two functions that do not distinguish the value of the usage of GEL and PKT.

5.3 Implication for management

There are several factors identified at R&D Mölndal that speaks in favour for AstraZenecas and their growing need for sharing information. During our research we identified that AstraZeneca has a generally open environment, the employees acknowledge the importance of information sharing and there is already today several projects conducted in order to support information sharing. The following three aspects have been brought forward as important features for further implementation of the portal development. Although these implications are designed for R&D Mölndal we believe that they could be applicable for the whole R&D organization. These issues are directed especially to the management team responsible for the development and the implementation of the portal. We believe that the following implications can be of benefit AstraZeneca, as well as for other organizations in the same situation:

- *Informal networks:* In order for the portal initiative to succeed there is a need to utilize the current use of informal networks i.e. facilitation techniques that makes it easier for users to communicate with an informal network. Benefits with using information technology are that information can be delivered to projects-members despite geographical distances. In order to gain new contacts there is a need to implement an "employee bank" which can consist of employees' knowledge skills in different areas so that employees can gain new contacts easily. This will result in that employees can expand their currently obtained informal network with new virtual contacts.
- *Focus on user perspective:* Organizations need to put ease of use and usefulness in the centre of attention so that users adopt the portal. Ease of use and usefulness can be obtained by designing an easy to use graphical interface for the users and it should consist of a uniform navigational structure that contains browsing features. There is also a need to have search tools that assist the user's search activities and take relevant feedback into consideration. In order to fully facilitate the usage of portals and increase the ease of use and usefulness there is a need to consider end-user training. All users do not posses excellent skills in navigating and using a computer. Therefore, it is importance to provide end-user training seminars where employees can ask questions and learn to use and witness the benefits of the portal. An extensive involvement of users in an initial stage of an implementation will also have a large impact on how the portal is adopted. By doing so, ease of use and usefulness comes as a result i.e. users' design their own tools because they are the real users of the system and knows what other employees need.
- *Personalization of the portal:* Customisation and personalization are two expressions that are frequently discussed in both literature and our empirical study. Due to the information overload that currently exists, it is hard to find customized information that fulfils a specific user's need. Ways to limit this information overload would be an advanced personalization where the user's specific work-related information is displayed. This could be in the form of displaying areas that the user is interested in, project-related information and other news of interest. The current situation where only limited personalization is provided is not sufficient enough to fulfil users' needs.

5.4 Limitations and further research

Our thesis was limited to a high degree by only expressing the opinions of employees on AstraZeneca's Swedish R&D site in Mölndal. This could have the effect that our research does not fully reflect the truth about how information sharing is performed in the whole organization. Due to lack of time we had to do a limitation about what was brought up from the already done survey. It would have been interesting if more comments from users in this survey had been in the thesis. The survey was global while our study was limited to one R&D site in Mölndal; this has had the effect that we could not verify our findings with the rest of the organization. Other limitations, when it comes to the survey, were that we had no ability to affect the design of the survey; we were given a predefined structure of questions. This had the effect that our own qualitative study was directed so that it would fit in to the survey parts explained in the thesis and therefore we might have

missed new angles of incidences when it comes to information sharing. The portal had not yet been implemented when this inquiry was done, therefore the result could be that our result does not reflect the truth of how it is going to look when the portal has been implemented, our discussion and interviewees opinions can be seen as visions about how it might be when the portal is implemented.

The study that we have carried out is just a tiny aspect of a huge and new area of business technology. What should be pointed out is that the empirical study that we conducted was made on one site within the organization. It would have been interesting to do a similar study on another site within the organization and compare the cultural aspects as well as map out how information is shared between the users. At least conduct interviews with other co-workers in another country. An area that is very interesting is how to gain a mutual consensus for how information should be shared throughout the organization. Information overload was a major aspect that was brought forward during our study. How to tackle this issue would be of great interest for any organization.

Our study was carried out when the initial implementation stage was to be carried out at AstraZeneca. What would have been interesting is to follow the development of the implementation of the portal. Possible research questions could include how users react when using the portal and what the users considered being the most obvious advantages and disadvantages, respectively. Portals are a growing area that to this day still experiences a rapid growth and therefore we believe that the use of portals will increase even more in the future. Therefore, there is a need to do even more research within this area in order for organizations to gain more business value.

6 Conclusion

The research question in this thesis aims to study how the implementation of a new intranet portal in AstraZeneca R&D Mölndal relates to users ability to share information. We have found that the following technological factors and other aspects are essential in order to increase the information sharing capability in the organization:

First, informal networks play an important role in diffusing knowledge and sharing information. The study indicates that informal networks will still be more prominent over the usage of the portal when it is initially implemented. In this sense, it is important to view the portal not as an opposing force to informal networks, but to be an important vehicle for both facilitating networking and information sharing. It is vital to consider extensive end-user training and awareness activities in order for users to realize the benefits of using the portal. As our study show, informal networks will be promoted by the use of the portal by providing another way to share information. *Second*, geographical distances between various project members' decrease the ability to share information. A portal initiative could therefore increase the ability to work across borders and it could decrease the negative effects of geographical distances. *Third*, portals simplify the searching and browsing for information; this will increase the ability to find information and therefore shorten the search and browsing time. Effective ways of searching and navigating will promote information sharing due to the fact that information will be easier to find. *Fourth*, new ways of diversifying and sharing information can be provided to users via a portal. Virtual collaboration tools will enable users to exchange, share and discuss information and knowledge.

Implications for management is to utilize the current informal networks, focus on users and put ease of use in the centre of attention and decrease information overload through customisation and personalization of the portal.

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Appendix 1: Interview guide

The user
Describe one (or more) situation where you recently have been needed information:
- *Information need*: What did you need? Knowledge, information, a folder, a colleague. …
- *Information seeking*: What did you do? Where did you search? What sources? What criterion affected you choice of sources? Where did you find it?
- *Information use*: How did you use the information/knowledge? Did you share it with your colleagues?

The content
What type of information or knowledge do you need in your job?
- Where (in which sources) do you find it?

What are the biggest problem to get information?

How do you experience the issue of finding information in AstraZeneca? How do you search?
- When you search for internal information, do you consider the time consumption as acceptable? Is it easy to search information?

To what degree do you need the information that is presented and stored at AstraZeneca's intranet?
- What type? Who publish it?

Describe the process of posting information on the intranet
- How often do you make information available for others on the intranet? What type of information? Why? Who is the target group?

Environment, culture...
Describe with whom outside your own organization that you, on a regular basis, has contact with:
- Which groups/individuals? How often? On who's initiative (yours or theirs)? Why is the contact maintained? In what ways do you integrate (meetings, telephone, e-mail, videoconferences, …)?

How does the collaboration work in within projects? How does the collaboration work between projects?
- In what extend does other employees share information and knowledge within and between projects and organizations? In what ways? (meetings, telephone, e-mail, videoconferences, …)? Why?

In what ways do you share information and knowledge to co-workers and contacts?
- How often? What type? To whom? Why?

What possibilities are there for information sharing (in the form of scientific information, document etc) in your daily work?
- Does information sharing between different departments occur? If so, how? Do you utilize it? Why or why not?

Future
In the best of worlds, how would you share information?
- What things would you like to do that you can not do today? If there was a possibility to design a new system to share information, through your eyes how would it look? What technical aids would you like to be implemented?