Master Thesis in Informatics

Introducing the wiki concept to a knowledge organisation

A case study at AstraZeneca examining the important aspects of a wiki's initial phase

Erik Andersson, Per Rosenström and Sebastian Söhrman

Göteborg, Sweden 2007

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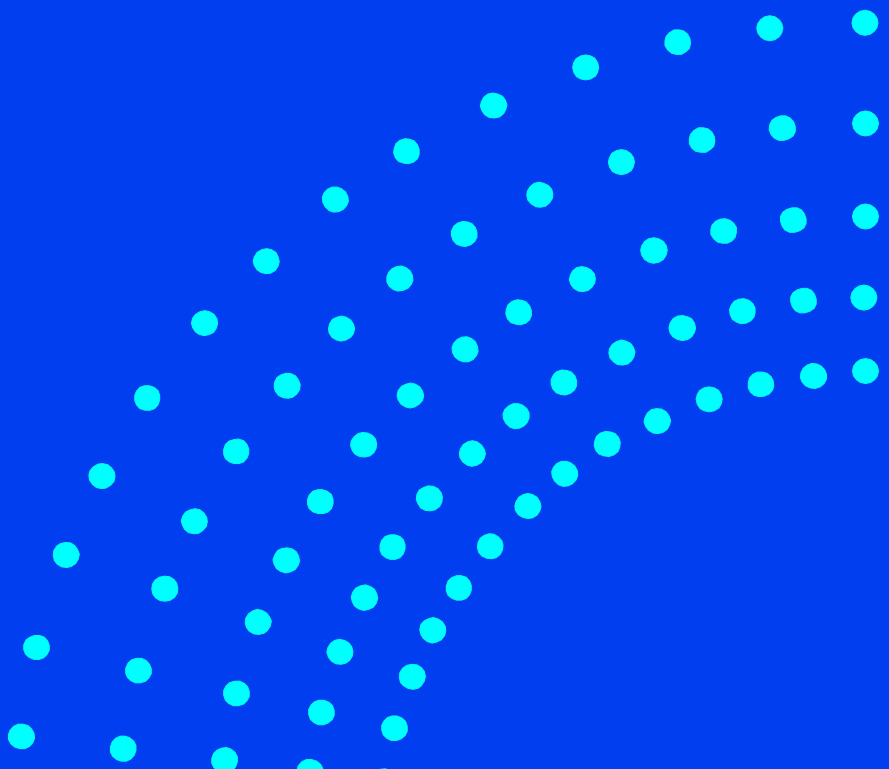

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Abstract

Knowledge is today viewed as one of the organisations key resources. This especially applies for knowledge organisations like AstraZeneca, in which knowledge must be handled in an efficient way. Different tools for managing knowledge have been developed over the years, but these seem to be missing the interactivity that the IT-solution wiki has. In this study we introduce the concept of wiki to a knowledge organisation and investigate important aspects that should be discussed when implementing a wiki. We introduced the individual users to the wiki concept during an initial interview and thereafter let them test the actual wiki pilot. After testing the wiki pilot we interviewed the users again to evaluate the usage and to verify key aspects when introducing the wiki concept to a knowledge organisation.

Keywords: Wiki, Knowledge Management, organisational culture, knowledge, sharing

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Gothenburg, 2007-05-29

Erik Andersson *Per Rosenström* *Sebastian Söhrman*

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1. Introduction

In the introduction we will give a background to the selected studied environment and the purpose of the study. In this section we will also explain the study's limitations and the disposition of this study.

1.1 Background

Gonzalez-Reinhart (2005) explains how publications about how to leverage what are believed to be a corporation's most valuable resource, the knowledge of the employees, arose during the 1990s. The author further addresses the issue of employees leaving the organisation, which results in the knowledge of the employee to disappear from the organisation. This raise the importance of leveraging the knowledge connected to the employee. Gonzalez-Reinhart (2005) claims that one study showed that approximately fifty percent of the investigated companies experienced considerable setback from loosing key staff. This is one case that shows the importance of leverage the employees' knowledge. Since the matter of leveraging knowledge is one of great importance, research in the field has been vast and the term knowledge management (KM) is used to acknowledge the practice of managing knowledge in a corporation. Gonzalez-Reinhart (2005) describes how KM is not only a technique but it also involves social aspects regarding for example user participation.

KM represents a great challenge for a company to reuse its knowledge. Several attempts to capture and distribute knowledge have been made during the years. For example, corporations have been applying an organisational Internet, called intranets, as a way to reuse the knowledge. Another common way is simply to have knowledge stored in databases from which information can be extracted. Gonzalez-Reinhart (2005) recognizes the potential benefits in the long-term of KM, but the different attempts to leverage and distribute knowledge may seem to lack user participation. For example, Stenmark (2005) claims that intranets are under-utilized which may be because intranets are developed on the basis of an industrial mindset and that the environment is read-only, which makes the usage of the intranet stale.

On the Internet a new technique has emerged, which is based on the users knowledge and participation. The concept is called wiki, and is a method in which the contributors are able to build their own KM applications (Gonzalez-Reinhart, 2005). Apart from being based on user participation it is also a concept that involves the user to create and edit pages of information.

This new approach towards making knowledge available to others is a concept that is getting more and more attention. Organisations are constantly looking for ways to improve the management of knowledge and have, hence, begun to look at the concept of wiki. Internet wikis such as Wikipedia has been very successful and has gained more users and pages of information over the years.

The concept of knowledge organisation can nowadays be defined as an organisation that recognises the primary value of knowledge within its workforce. KM is therefore an important issue for organisations, and there are different ways to take care of the company's most central

resource, knowledge. In knowledge organisations, it is around knowledge that the organisation binds its success.

For a company highly dependent of knowledge, like AstraZeneca, there is a need to leverage and make available the knowledge of its employees. In this matter, the wiki concept may represent a potentially valuable alternative.

1.2 Purpose

The purpose of this study is to identify key aspects when introducing a wiki in a knowledge organisation. This study's focus is on the initial stage of the wiki implementation. We present key aspects when introducing a wiki in a knowledge organisation and we will then verify if the key aspects are aligned with the users' experience. We want to bring forth a deeper understanding of the possibilities and issues when introducing a wiki in a knowledge organisation.

1.3 Question at Issue

Which are the key aspects when introducing the wiki concept to a knowledge organisation?

1.4 The Case

The pharmaceutical company AstraZeneca was formed in 1999 when Astra AB of Sweden merged with Zeneca Group PLC of the UK. These two companies had similar science-based cultures and connections to the pharmaceutical industry, and became one of the world's leading pharmaceutical companies. AstraZeneca's primary business is discovery, development, manufacturing, and marketing of prescription medicines for patients. The medicines are in the area of cancer, gastrointestinal etc. The company has products in over 100 countries and around 65000 employees. The headquarters are in London, UK, with the R&D headquarters in Södertalje, Sweden.

1.5 Delimitation

Perhaps the most significant delimitation we had to make in this study was to accept the fact that a wiki is an organic environment that grows over time. For a wiki to develop and be widely used could take months or even years. We had to accept that under the scope of time available to us, approximately 4-5 months, we had to focus on the introduction phase of the wiki. Thus, we have had little chance of predicting a wikis further development. The time limit has been a distinct delimitation affecting our study. Under the scope of our study we had a limited user group of around ten individuals. For this study to be useful we needed the participation of users, and we had to accept that many of the employees had a busy schedule with work tasks that had to be performed. Hence, the users we chose had to have time to actually take part in our study. In this study we have a focus on the social factors, involving the users, which is an important aspect of KM. We acknowledge the fact that the wiki includes a technical foundation, but in this study we don't aspire at making a greater understanding of that area.

In this thesis we have chosen to primarily focus on knowledge creation and sharing factors in a social context. However, we are aware that human construction of meaning is of vital importance in KM because it is only when information or knowledge guides decision-making that the concept of KM gets fully utilized (Alavi & Leidner, 2001; Malhotra, 2002).

Another area within KM that we have chosen not to seek insight to in any greater detail is meta-knowledge. Meta-knowledge is also known as *knowledge that you know you have got*, which gets created by self-reflection. This mechanism is ultimately closely connected with the level of meaning that an individual knower ascribes to a particular object of knowledge (Glazer, 1998). Another important effect of meta-knowledge is that it affects which aspects of learning that an individual thinks could be relevant for others (Alavi & Leidner, 2001).

1.6 Disposition

The disposition of this thesis is as follows: in the next section, *Method*, we will introduce our scientific approach in this study and our methodology. The scientific approach we chose is introduced in a way that enables the user to make own conclusions whether the approach was suitable for the study or if another approach should have been taken. In the section *Theory: Background* we will introduce terms that have an influence in our study, and in *Theory: Focus* we will introduce the key aspects of the wiki concept according to previous studies. In the *Results* chapter we will introduce the setting for this study, the results from the first and second interview phases, along with an overview of the wiki application we implemented. In the *Discussion*, we will discuss the results in relation to the theories introduced in *Theory: Focus* and from that we verify the selected theories. In the last section, *Conclusion*, we will summarise the discussion in relation to the question at issue.

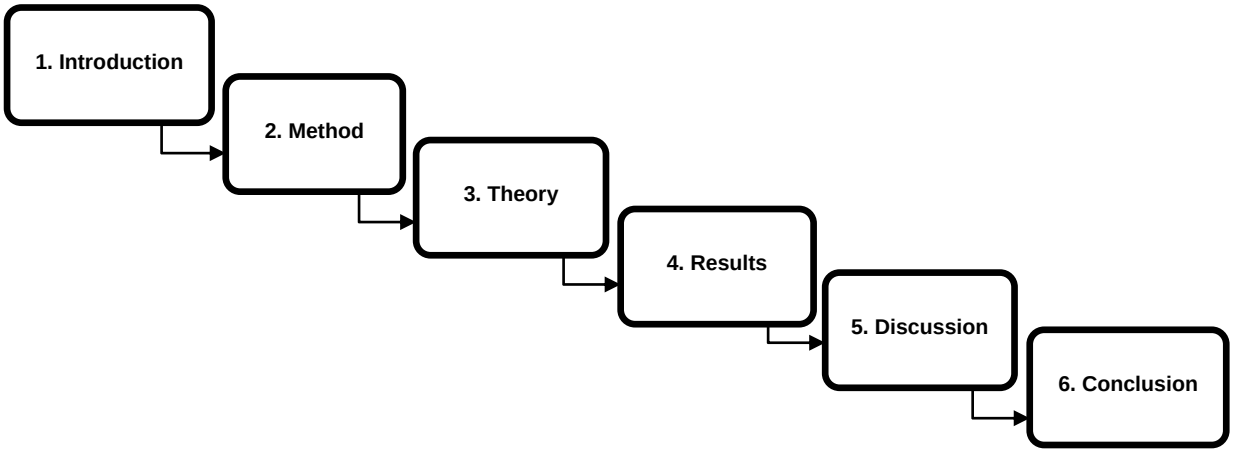

Figure 1. The disposition of the master thesis, including connections between chapters.

2. Method

In this chapter we will describe how we have approached our research issue. The method is the way we have carried out this study regarding scientific viewpoints and which practical decisions we have taken.

2.1 Scientific Approach

First off, when undertaking a study it is important to clarify the researcher's worldview. The term ontology is used when discussing the worldview. Ontology is the view an individual has on the world and its content, when undertaking a research study. Based on earlier studies, Easterby-Smith (2002) defines ontology as the assumptions that we make about the nature of reality. In the matter of ontology we have a nominalistic view. Our view of the world, and the subjects studied in this thesis, is that it is a social construction. The name given to certain concepts are based on people and their experience as we see it.

Continuing epistemology is defined as a general set of assumptions about the best ways of inquiring into the nature of the world (Easterby-Smith, 2002). The concept of epistemology is the philosophy that investigates the nature, methods and extent of human knowledge. Epistemology is the study of what is meant by knowledge (The Shaping of the Modern World – Glossary, 2007). What does it mean to know something as opposed to merely having an opinion? Epistemology is closely connected to a person's worldview. In our research study we have the viewpoint of social constructionism. We believe the reality to be socially constructed and that people give meaning to concepts and knowledge. This view is also connected to the nominalistic worldview we use in this thesis, in which labels are used to give meaning to the social construction. We think this view is suitable since we in our study are trying to gain a greater understanding of people's opinions rather than trying to find true, objective knowledge. Our study is based on individuals' participation, which makes an approach for objective knowledge difficult. Based on peoples experience we are trying to draw conclusions.

As well as having a philosophical worldview and an epistemology viewpoint, there are different forms of research studies that can be carried out. This master thesis is aimed at having two possible relations to theory, reflection and invention. Reflection in the case that our research is built on existing theories and concept, and by placing these theories and concepts in an organisational setting we are trying to verify if these are still valid. However, we also aim to open up for the possibility of theoretical invention. To perform theoretical invention and reflection two different ways of reasoning are required. First to be able to verify theories we use a deductive approach, and second since we open up for new insights we also plan to utilize an inductive approach.

Finally, in our study we have focused on a qualitative approach that goes in line with our selected ontology, which sees the truth dependent on the individual that establishes it. Our epistemological viewpoint social constructionism, which is based on people giving meaning to reality, is also suitable since we by selecting a qualitative approach can attain a deeper understanding.

2.2 Method of Investigation

The method of investigation is the practical approach towards an answer to the research issue. In this section we will describe our selected methods and how they connect to each other.

Methodology is the method approach and the relationship between the chosen methods in a research study. The connection between the chosen methods serves the purpose of bringing an overall view to further serve the purpose of the research question in focus. There are several kinds of methods that can be used when undertaking a research study, for example interviews, ethnography etc. Each of the chosen methods should be discussed for and serve the overall purpose of the research study. The methods that are chosen determine the approach of the study. In our study we began with selecting relevant theory, based on previous studies, in relation to the research issue. These theories served as the input to the selection of key aspects which are introduced in the chapter *Theory: Focus*. Thereafter we performed the first interview phase, in which we wanted to get a deeper understanding of the interviewees' information needs. From this interview phase we gathered important answers that served for the design implications in the wiki pilot. After the users had been testing the wiki pilot, a second interview phase was made to evaluate the usage. The answers from the second interview phase were then used to validate the key aspects and to further discuss interesting aspects that the users addressed. Our selected method of investigation is described in the figure below.

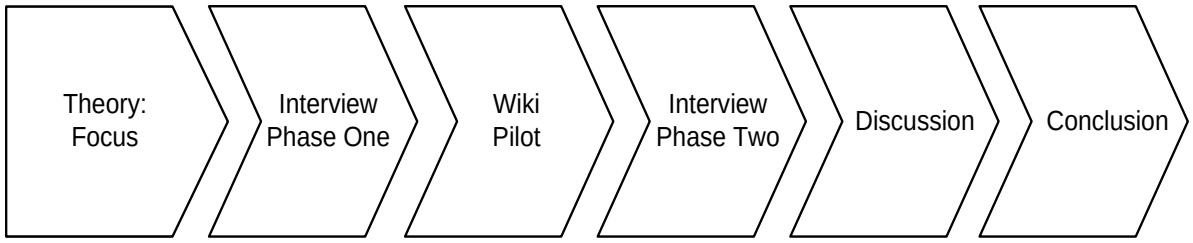

Figure 6. Our selected method of investigation.

2.2.1 Theory Collection

When we collected theory our primary approach was literature survey. It is important to note that literature survey per se is secondary information. That is, the literature is often written for another purpose and perhaps has a different viewpoint than the study at hand. Thus, one should carefully consider which purpose the information fills and that it may have a different focus regarding for example worldview. Also, one should note that the information search process for relevant literature may exclude information, for example – search words on a search engine on the Internet might not be specific enough or too broad. Hence information may be missed.

There is also a difference in what kind of literature that is more useful than others. For example, books seem to be a good source for information, but many forget that many books are written and published in a commercial sense. Of course, books published by universities and research institutes can be seen as more objective and non-commercial, but still this is a thing to carefully consider when relying on books as an information source. Another important negative feature of books is that they are not up-to-date. For example, books regarding some IT can be out-dated in a

couple of years. Many books in the information technology field lose its purpose in a couple of years, although some concepts are timeless.

Perhaps a better source of information is scientific articles, which is published in scientific papers, magazines, and on conventions. These articles are often reviewed several times before it gets accepted. These scientific articles are also more up-to-date and often without a commercial interests.

Overall, literature survey is a good method for getting a good background on certain subjects. Especially through the use of the Internet can much literature can be found. But the reliability on the Internet must be discussed, since it is to a high degree a forum where information can be published without regard to the reliability in the text. We especially searched for information in the area of KM, wiki technology, communities and cultural factors. In particular, we searched after articles published in scientific papers in the information technological field.

Alavi and Leidner's article *Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues* (2001) is an information source which has been widely cited by a variety of researchers, among them Stenmark (2005). The article gives a thorough introduction to different knowledge concepts, such as KM, and relates this to organisational theory.

We think the articles gathered from scientific magazines can be view as a good foundation for our research and we believe that the information found in the articles was useful in giving us a theoretical foundation for defining key aspects when introducing a wiki in a knowledge organisation.

2.2.2 Interviews

Interviews are an often-used method in qualitative studies. They are the primarily way of collecting information to form an understanding of that which is being studied. The alternate, quantitative approach is questionnaires, which tries to categorise information. Both the results from the interviews and questionnaires are primary data. That is, the information received from the respondents is based on the researcher's direct questions that serve the overall purpose of the study. This makes it critical for the researcher to carefully consider which questions to ask and to make sure they are not biased to attain a certain answer.

The purpose of the first interview phase we conducted was to receive answers, which were used to decide and design the wiki pilot's structure and content. The second interview phase purpose was to evaluate the wiki pilot usage and to verify the key aspects when introducing a wiki in a knowledge organisation. The users that we interviewed and which participated in the wiki pilot works in the PAR&D (Pharmaceutical and Analytical Research & Development) section of AstraZeneca. PAR&D contributes to drug developments of new products.

2.2.2.1 Interview Phase One

The purpose of the first interview phase was to get answers that helped us make design decision regarding the wiki pilot's structure and content. The interviews were made with seven

respondents which all but one had a connection to the knowledge area of Poorly Solubles. Poorly Solubles is a knowledge area devoted to problem solving regarding compounds with low solubility. The participant who didn't have a connection to Poorly Solubles instead contributed with a business view and had knowledge when it comes to projects. The interviews were based on a semi-structured approach, which is more open for discussion than structured interviews since unstructured interviews can be less connected to the purpose. We tried to make the questions open, so that we didn't lead the answer into a particular direction. The interviews with the wiki pilot participants were one and a half hour long, and the participants were allowed to ask us questions at any time. We tried to make the questions as objective as possible. The layout of the first interview can be found in Appendix 1.

2.2.2.2 Interview Phase Two

The second interview phase purpose was to capture the reaction of the user group regarding the wiki usage to verify theory. This interview phase was also semi-structured but the questions were to a great extent shaped to verify our theories in *Theory: Focus*. For the second interview phase we made the user group bigger by including another three users. We realized that if we wanted to verify the theories with high validity we needed a bigger user group. This interview phase was made in approximately one month after the introduction meetings we had with each participant, except for the three users we later added which got to use the wiki in about two to three weeks. Although second interview phase was more specifically aimed at verifying our theories we tried to keep the questions open to get answers outside the limits of the theory verification. The interviews in phase two were, like the first, around one and a half hour at length. The layout of the second interview can be found in Appendix 2.

2.2.3 The Wiki Pilot

Before the users got access to the wiki we introduced the concept and the functionality of the wiki to the users. During one and a half hour we showed how to add a page, how to edit a page, how to search information etc. We also provided the users with some PowerPoints and walkthrough-documents on how to use some of the basic functionality of the wiki. After this introduction meeting the users got access to the wiki pilot. For about a month the wiki pilot for the knowledge area Poorly Solubles was up and running for the users. During this time we used participation observation methods, as we participated in the wiki by giving advice etc. This method is used when the researcher both observes and interacts with the studied phenomenon. The downside of this approach is that the result will be less objective than in an ordinary observation. But on the positive side the results may be more valuable since the researchers' efforts to understand the studied phenomenon is enhanced.

We found this to be a good approach since the wiki pilot was in the development phase, where we could contribute and accelerate the wiki usage among the users. During the course of the wiki pilot the users in the user group could phone or e-mail us for help, and we answered either by phone, e-mail or by publishing information in the wiki. In the wiki we also gave suggestions on how to solve the issues addressed by the user. Initially we added a little information connected to the area of Poorly Solubles, sent to us by e-mail from the users, so the wiki pilot had some content to start with. During the course of the wiki we also made tasks for the user to solve. The first task was to create an own user profile, to add information, and to help develop personal and

project templates, which can be used to more easily publish new information about individuals and projects. The first task was introduced to the user group in the first week during the course of the wiki pilot and we wanted the user group to do this work task in approximately a week. The second task was for the user to add five individuals connected to the knowledge area Poorly Solubles, on a specific person page. Our intention was when all the users had added persons and information they could see what they all created together. We used the person template developed in the first work task, for the users to easily publish information regarding specific persons.

During the course of the wiki pilot we also put down our own thoughts in a diary. In it, we wrote down information on the wiki usage on an everyday basis. For example which persons used the wiki, how the persons altered the structure, which issues were encountered etc.

2.3 Validity, Reliability and Objectivity

When undertaking research it is important to question the validity, reliability and objectivity of the study. These are different measurements that must be discussed to ensure the quality of a research study.

In this study we have tried to maintain a high degree of reliability, validity, and objectivity. To keep the study reliable we try to reason about our decisions and about what choices we have made during the course of the study. The measurements we have used are closely connected to a qualitative approach, which is open to the participants' opinions regarding the wiki concept and the wiki pilot. The measuring instruments have been the interviews and also the wiki pilot. We believe that if another researcher were to investigate the introduction of a wiki in a knowledge organisation the results would be similar since we haven't found any particular factors that would dramatically affect the outcome of this study.

Regarding validity, we believe that this study accurately assesses the concept that is meant to be measured. We wanted to see how the users used the wiki and how their usage reflected the theories, and we believe our research method acknowledges this. Regarding the external validity we have no opinion on the generalisability of the outcome, however we haven't excluded the possibility since it is too early to decide.

Regarding the internal validity, we think we made the right decisions based on the theories we collected and how the wiki pilot was implemented. For example, we decided to go with a qualitative approach to understand the users' need. We also tried to formulate the questions in such a way that they couldn't be misinterpreted, and we also tried to keep the questions open.

To keep the study as objective as possible and strive for valid results has been our aims in this study. Our chosen method has also been described in a detailed way to clarify the course of action. Finally we have also managed the references in a suitable manner.

2.4 Criticism to Method and Alternative Method Approach

In this section we will discuss critique towards our chosen methodology and which alternate methods could have affected the study differently.

First off, it is important to notice that it is time-consuming for the wiki to evolve. For example, it has taken Wikipedia years to evolve into what it is today. During that time much information has been built up to provide a critical mass of information. For a wiki to evolve and in a great way be a target for community features much time is required. This is critique that is difficult to ignore, since the lack of time prevents the wiki from evolving.

An aspect that influenced the outcome of the study is the wiki pilot itself. Although the wiki used in this study, Atlassian's Confluence, is regarded as one of the top wikis, used by several established companies, there may be other wikis that may use more suitable functionality.

Regarding using an alternative method; this study is based on qualitative measures, but could use quantity measures. But to use qualitative methods, such as questionnaires, would not be useful to gain a greater understanding of the situation.

3. Theory

In this chapter we introduce the basic concepts on which this study is built on. We have separated the theory into a Background-section and a Focus-section to make it clear which theories are in focus in this study.

3.1 Theory: Background

In Theory: Background we want to give a background to the concept upon which a wiki is built. This theory is only used to give a foundation for the concepts related to wiki. This theory will not be verified in the Discussion of the thesis.

3.1.1 The Area of Knowledge

To better understand the area of knowledge it is important to know the differences between the concepts of data, information and knowledge. We will also introduce the concepts of KM and KMS (Knowledge Management Systems).

3.1.1.1 Data, Information, and Knowledge

When discussing knowledge, the concepts of data, information and knowledge are often distinguished. Several definitions of data, information, and knowledge have been suggested from different authors. According to Alavi and Leidner (2001), a number of authors in the information technology field address the issue of defining knowledge by distinguishing the concepts of knowledge, information, and data. They claim that a great deal of emphasis is given to understand the difference amongst data, information, and knowledge, and drawing implications from the difference. Alavi and Leidner (2001) describe data as facts, e.g. raw numbers, without meaning. Information is interpreted data, i.e. data that is meaningful to someone. Knowledge is personalized information. This is probably the most common viewpoint on the relationship between data, information, and knowledge: to perceive data as unprocessed numbers and facts, whereas information is processed data and knowledge is authenticated information.

Alavi and Leidner (2001) discuss this hierarchical view of the definitions of data, information and knowledge, as this presumption with different dimensions e.g. context, usefulness and interpretability, don't endure thorough evaluation. When distinguishing between information and knowledge, the aspects of content, structure, accuracy or utility is not enough. Knowledge can be seen as information that has been managed in the mind of individuals, in other words: knowledge is personalized information. This view of knowledge relates to personal views on facts, procedures, concepts etc. (Alavi & Leidner, 2001). With this view, information is transformed to knowledge as it is processed in the mind of individuals. Likewise, knowledge becomes information once it is articulated and presented in the form of text, graphics, words, or other symbolic forms (Alavi & Leidner, 2001). The authors argue that the most significant implication regarding this view of the concepts data, information, and knowledge is that for individuals to share a common understanding of data or knowledge, they must share a certain, common knowledge base.

3.1.1.2 Explicit Knowledge and Tacit Knowledge

Next we will examine the most common way of defining different kinds of knowledge. This is to divide knowledge in the dimensions of either explicit or tacit kind.

Explicit knowledge is knowledge that can be codified in a formal and systematic approach (Small & Sage, 2005). The knowledge defined as explicit can be facts found in books, computers, or information stored in different knowledge repositories. Explicit knowledge is a codifiable component that can be disembodied and transmitted, a notion analogous to knowledge, the know-what, which can be extracted from the knowledge holder and shared with other individuals (Hahn & Subramani, 2000). Further, the explicit knowledge can be expressed, codified, and communicated in symbolic form and/or natural language (Alavi & Leidner, 2001). An example of explicit knowledge is a user manual.

Tacit knowledge is closely connected to the individual, and is difficult to articulate (Small & Sage, 2005). This knowledge type is to a high degree based on the individual's contextual experiences. Tacit knowledge is knowledge that has a personal quality that makes it hard to articulate or communicate or, analogously, the knowing or the deeply rooted know-how that emerges from action in a particular context (Hahn & Subramani, 2000). The tacit knowledge dimension is based on the concept of tacit knowing, which was developed by Polanyi (1966). Polanyi describes how individuals know more than they can express, and illustrates this by using the analogy of face recognition. Humans can recognize another human's face, but to articulate and describe it is more difficult.

3.1.1.3 Organisational Knowledge

Organisational knowledge, or enterprise knowledge as it is also called, is a concept of great importance to gain a competitive advantage.

Organisational knowledge is a mix of individual, group, organisational and inter-organisational experiences, values, information, and expert insights (Small & Sage, 2005). The foundation of organisational knowledge is the individual knowledge workers interaction with the environment, for example other knowledge workers. Knowledge can be created and shared on multiple levels, without limiting the knowledge to the individual level, thus making knowledge available to a group or the organisation. Since explicit knowledge is believed to have higher legitimacy than tacit knowledge there could be problems. The fact that explicit knowledge has a greater legitimacy could lead to a favouring of explicit knowledge, which could make an organisation to focus on explicit knowledge instead of possible contradictory tacit knowledge.

3.1.1.4 Knowledge Management

To create value in an organisation through the use of knowledge the concept of KM is used.

Although there is no common, agreeable definition of KM, there are common themes (Stenmark & Lindgren, 2003). In the absence of a common, unambiguous definition of KM, Stenmark (2005) identifies key factors that several authors have discussed. Based on these key factors, Stenmark points out KM to be the processes of sharing and/or transferring knowledge within an

organisation and amongst its members. At a minimum, KM consists of four basic processes (Alavi & Leidner, 2001). These processes are creating, storing/retrieving, transferring, and applying of knowledge. These major processes can be further subdivided, e.g. into creating internal knowledge or acquiring external knowledge (Alavi & Leidner, 2001).

A definition that has been cited in several research studies is Alavi and Leidner's (2001) definition, which states that KM is the systematic approach and organisationally specified process for acquiring, organising, and communicating knowledge of employees so that other employees may make use of it to be more effective and productive in their work. KM is further used to identify and leverage knowledge to make the organisation more competitive (Alavi & Leidner, 2001). KM is used to increase innovativeness and responsiveness. KM is essentially regarded as an organisational process which consists of various activities. These activities are labelled differently among authors (Stenmark, 2005). Alavi and Leidner (2001) further mean that KM involves improvement of the individuals learning and understanding process by stipulation of information. The concept of KM centres on the exposing of information and facilitate assimilation of information (Alavi & Leidner, 2001). KM is further based on construction of core competencies and the understanding of strategic know-how. O'Leary (1998) has defined KM as the formal management of knowledge resources, which is used to facilitate access and reuse knowledge that is commonly enabled by information technology. When talking about knowledge resources, O'Leary means it varies for each organisation, but generally the term is used to describe manuals, letters and knowledge closely connected to work processes.

Often the need for a KM-solution has been highlighted when an organisation loses key staff. When leaving the organisation, the individuals take their knowledge with them. Thus, a KM can be seen as a tool used to oppose the loss of income and knowledge when employees with knowledge leave the company. A closely related matter is when the knowledge an individual needs is to be find inside the organisation, but the individual don't know where to find it. These issues raise the need to maintain, structuring, and locating knowledge, and thus attempts to manage knowledge through KM is an approach. The matter of losing valuable knowledge when an employee leaves the organisation is a major problem that has made organisations in various domains to closely investigate different KM-solutions. Dingsøyr and Røyrvik (2003) describe how KM has been in focus in a variation of business domains, such as software engineering, over the years. The concept of creating, leverage, and share knowledge has been highlighted in many corporations. Gonzalez-Reinhart (2005) acknowledges that the hype of KM has lessened since the 1990s but that the potential benefit for organisations in the long term remains. Corporations are still open-minded toward KM-solutions to sustain competitive advantages. Effective KM motivates employees to find unexpected new ways to put knowledge to work (Stewart, 2002). As the companies are getting more and more dependent on valuable information, many companies today rely on the value from intellectual assets rather than physical assets.

3.1.1.5 Knowledge Management Systems

Knowledge Management Systems are defined as tools that are used to effect the management of knowledge (Hahn & Subramani, 2000). KMS is information technology such as document repositories, databases, discussion list etc. That is, they are IT-based systems developed to support and enhance the organisational processes of knowledge creation, storage/retrieval, transfer, and application (Alavi & Leidner, 2001). KMS objective is to enable the formation,

communication and utilization of knowledge. The concept of KMS includes a variation of technology based initiatives, for example the creation of databases of expertise (Hahn & Subramani, 2000).

KM initiatives in organisations are gradually becoming more important and corporations are making considerable IT investments in deploying knowledge management systems (Hahn & Subramani, 2000). Lorentzon and Sandin (2006) mean that modern technology is important for the integration between carrying out a task and the intellectual knowledge. The information technology is only an enabler for supporting employees with their work tasks, and to enable individual and collective knowledge sharing. Alavi and Leidner (2001) describe that KMS is not radically different from already existing information systems, but KMS is instead aimed towards easier access to information for the user. The role of information technology in relation to KM is to represent opportunities to gather, store and transfer knowledge.

It's important to note that KM as a concept is not committed to IT, for example – a library can be an application of KM. KM is primarily a process and not a technical endeavour (Gonzalez-Reinhart, 2005). But the process of acquiring knowledge and sharing knowledge in an organisation can be more effectively made by the use of IT. Stenmark (2005) describes how the information creation, information seeking, and information interpretation in a corporate context expresses the interaction between knowledge and information. While not all KM initiatives involve an implementation of IT, KM solutions often rely on IT as a key enabler (Alavi & Leidner 2001). For example, KMS can be used to find a person with specific competence or knowledge regarding certain projects. For an organisation to increase effectiveness, efficiency, and competitiveness they choose to implement KM practices and systems (Gonzalez-Reinhart, 2005).

An important issue to address is the reach of the KMS. With reach both the actual size of the user group and the diversity among the users should be taken into consideration. Although a greater group size and diversity is advantageous to some extent it can also be damaging. As the size of the group increases and the diversity of the users are becoming greater, this will have an affect on the size of irrelevant content and useful information in the KMS. If the user group is small, the users will collectively loose valuable input. This input could be obtained with a more comprehensive, broader participation. But if the user group is bigger, the system as a whole may be too broad and there may be a risk of an overload of irrelevant information. Therefore, organisation and managers should carefully consider which size the group should have and what opportunities it represents. It is critical that the KMS fulfil the needs of the user, and it should be based on the usefulness for the user (Hahn & Subramani, 2000).

Stenmark and Lindgren (2003) discuss the fact that the intranet is a natural base for knowledge management systems, and that the intranet assists in creating a user-friendly and cost-effective environment.

3.1.2 Intranet

An intranet is the foundation, the infrastructure, when implementing a wiki in an organisation.

An intranet is essentially an intra-organisational Internet. In a technological viewpoint, Stenmark (2003b) defines intranet as a subset of the Internet, which makes the intranet have several characteristics in common with the Internet. He has found three common aspects the two concepts share, and one unique aspect of the intranet. The Internet and the intranet share the characteristics of hyper linking, networking, and flexibility. The fourth characteristic of intranet, which makes it differ from the Internet, is organisational boundaries. The characteristics discussed by Stenmark (2003b) will be further examined.

To create hyperlinks, highways to find resources, is probably the most important feature of the web and intranet (Stenmark, 2003b). This feature is highly important and makes the search of relevant information more effective. Information anywhere on the Internet or the intranet can be relatively easy accessed (Stenmark, 2003b).

Networking is an essential characteristic for the Internet and intranet. Both the hardware and the software may be physically distributed, and the authority may be physically dispersed (Stenmark, 2003b). The web's client/server architecture and uniform resource locator (URL) allow the information to be distributed without thinking on physical boundaries, thus making location a lesser issue (Stenmark, 2003b).

Stenmark (2003b) claims that since the web is a technology driven by a bottom-up approach, it allows individuals to develop so-called add-ons that enable development in different directions. The multitude of uses of the Internet allows for a great flexibility for individuals to shape the web.

Apart from the characteristics described above, intranets are also organisationally bounded. This makes the intranet only accessible for the users within an organisation. This aspect is of great importance to organisations that may handle classified information which other companies shouldn't have access to. This aspect of intranets enables members of an organisation to openly share information with each other.

The intranet is an enabler for knowledge sharing. Stenmark and Lindgren (2003) describe how intranet research on knowledge storing and retrieval has developed in two different perspectives. Either the intranet is seen as an unstructured knowledge base or, on the other hand, as a medium for exchange of information. Stenmark and Lindgren (2003) claim that whether knowledge is viewed as either static or dynamic, intranets can be viewed as an infrastructure for knowledge work or as a general knowledge system. The intranet is in many ways ideal for knowledge transfer among employees.

3.1.3 Community

Community is a concept of importance in the user-generated environment of a wiki.

The term community is used to describe a group of individuals sharing an environment. The term can be seen as somewhat ambiguous (Smith, 2007), as it is used to describe groups that range from neighbours to nations and levels of solidarity from the personal to the professional. In a more general sense a community can be defined as a set of on-going social relations bound together by a common interest or shared circumstance (Smith, 2007). By that general approach, communities can be intentional or unintentional, as a participant may purposely join a community or become a member unintentionally. Despite the ease with which the term is used, there is no single characteristic that easily defines what a community is or identifies a particular social formation as a community without ambiguity (Smith, 2007). The solidarity-aspect of a community could seem obvious, but it can vary greatly and communities can be of competitive kind rather then cooperative. Although conflict and divisiveness can be present, the distinguishing mark of communities is its cooperation; a community can be said to have failed when it is no longer able to foster any cooperation among its members (Smith, 2007). When talking about community in an IT context, the term virtual community (or online community) is used. This term refers to a group of individuals that communicates or interacts via the web.

3.1.3.1 Strong and Weak Ties

Online communities can include both so-called strong and weak ties as it is dependent on social interaction and sharing between its members. When an individual has a close connection to another individual in a community context, it is called a strong tie. Weak ties are individuals with little or none connection to another member in a community.

It's argued that close ties in a community environment limits the knowledge creation process, which is based on the fact that individuals are unlikely to encounter new ideas in an environment with individuals that possess similar knowledge and information (Alavi & Leidner, 2001). Usually individuals help people they know, people they like, people who are similar, and people who have helped them in the past (Constant et al., 1996). This raises the need for weak ties that makes individuals trigger new ideas and concepts that develops new knowledge. The alternate view, which promotes the use of strong ties, points out the fact that knowledge creation is better suited in a community with close ties since it involves people with a common language and this would make discussion of topics and challenging of others ideas easier. In both strong and weak tie communities, the members rely on an unwritten social contract between each other.

When a community to a great extent is based on weak ties, this addresses the issues of taking help from strangers (Constant et al., 1996). The information seeker can't assess the information provider's reliability, expertise, or possible strategic motives for misinformation. The information seeker has no control regarding the information provider's incentives. In the alternate view, the information provider has also limited information about the information seeker, and hence it's possible that a misunderstanding may occur. E.g. the information provider may make false assumptions or formulating a response with concepts unknown for the information seeker. It is important to note that the difficulties that may occur when searching and answering should be

increased with the ties weakness, i.e. the physical and social distance of the information provider from the seeker (Constant et al., 1996).

3.1.4 Wiki

The knowledge created within an organisation can be stored and shared using an intranet based KMS. If the purpose of a KMS is combined with the power of user driven communities we get the foundation of the wiki concept.

3.1.4.1 Background

The most central thought behind the wiki is to create a website where anyone can change the content of any page. Creating new pages, links, and changing content should be as easy as possible, meaning focus should be at ease of use, not appearance. A big difference between wikis and regular websites is that the wiki makes no difference between reader and author; each page has a link to gain direct access to editing of content. A wiki is essentially a collection of user-generated wiki pages connected through hyperlinks. The foundation for this tool is web technology, i.e. the HTTP protocol and the web browser (Leuf & Cunningham, 2001). A wiki is a server-side technology based on the community idea and presupposes the community members themselves (implicitly) to agree upon and maintain a working structure (Leuf & Cunningham, 2001). In other words, the users are allowed to design not only the content but also the structure, and the structure is thus not static but emergent and shaped by the users' changing understanding of the content. The wiki therefore always represents the community members' most current view (Stenmark 2005).

> *The simplest online database that could possibly work* – Ward Cunningham

Ward Cunningham, an American software programmer, developed the first occurrence of a wiki. He developed an add-on to the Portland Pattern Repository (a computer programming design pattern repository) trying to make it easier for developers to exchange ideas. He first published the software in 1995 on his company Cunningham & Cunningham's website. The software was called WikiWikiWeb (quick web). The concept is named after this software. *Wiki* means quick in Hawaiian. The largest wiki today is the online wiki-based encyclopaedia Wikipedia. According to a research conducted by comScore Networks (comScore Press Release, 2007), the Wikipedia with all its pages was in December 2006 the 6th most visited network worldwide (unique visitors).

The following list includes the design principles Ward Cunningham sought to satisfy with the first release of the wiki (Wiki Design Principles, 2007):

- *Open*
  Should a page be found to be incomplete or poorly organized, any reader can edit it as they see fit.

- *Incremental*
  Pages can cite other pages, including pages that have not been written yet.

- *Organic*
  The structure and text content of the site are open to editing and evolution.

- *Mundane*
  A small number of (irregular) text conventions will provide access to the most useful page mark-up.

- *Universal*
  The mechanisms of editing and organising are the same as those of writing so that any writer is automatically an editor and organiser.

- *Overt*
  The formatted (and printed) output will suggest the input required to reproduce it.

- *Unified*
  Page names will be drawn from a flat space so that no additional context is required to interpret them.

- *Precise*
  Pages will be titled with sufficient precision to avoid most name clashes, typically by forming noun phrases.

- *Tolerant*
  Interpretable (even if undesirable) behaviour is preferred to error messages.

- *Observable*
  Activity within the site can be watched and reviewed by any other visitor to the site.

- *Convergent*
  Duplication can be discouraged or removed by finding and citing similar or related content.

3.1.4.2 Wiki Characteristics

There are several different wiki software packages available today with various levels of functionality. Some offer a very basic set of functions while others strive to combine the easy wiki concept with a myriad of functions. In this section we try to explain the most essential wiki functions.

- *Change Log*
  The change log is one of the most fundamental functions within a wiki. It stores all changes made to a wiki page, giving the users the possibility to roll back to previous versions. Even pages that have been deleted can be restored. This function prevents both vandalism and editing mistakes.

- *Recent Changes*

Recent Changes is an automatically generated list of changes made to the pages within the wiki. Often visible is also the username of the person who made the change or that person's IP-address if anonymous entries are permitted. The wiki software often gives the user the option to mark a change being of minor degree if the change only was to correct some spelling errors for example, this will exclude that change to the recent changes list.

- *Hyperlinks*
  Since the most basic wikis use a flat structure there are only two ways of getting to another page in the wiki, either by searching or by using links. Links is the most essential way of constructing structure in a wiki. New pages are often created by linking to a non-existing page, and thereby giving it its name. This way, new pages are automatically integrated in the wiki structure rather than being created without connection to other pages. Most wikis use a link convention called CamelCase, which capitalize each word, and removes the space between them; the wiki will often automatically add a link the CamelCased text. TableOfContents, JohnDoe, and KnowledgeManagement are examples of the CamelCase convention.

- *Non-existing Pages*
  Most wikis way of creating new pages is to link to a non-existing page. That link will in some way, depending on the wiki software, be marked, letting the users know it isn't yet created. It is then up to the users to create it and start adding content.

- *Search Engine*
  The search engine is a very central tool within the wiki and more or less all wikis have one. It's important to the overall functionality of the wiki, especially as the amount of wiki pages grows. There are many levels of complexities to the search engine if you compare different wiki software, some analyse only the text within its pages, while others take hierarchy, tags, attachments etc. into account.

- *Back Links*
  A back link is essentially the information of where you came from to the page you are currently visiting. Since most wikis use a flat structure, it gives the users information about the trace of pages visited in the wiki.

- *Soft Security*
  The idea is to protect the system and its users from harm in gentle and unobtrusive ways to avoid unnecessary violence. At the core of the concept lies a philosophy where architecture is constructed with the intention to convince people to behave properly by limiting their possibilities of inflicting damage into the system. Those architectural design implications are constructed to preserve the socially driving force that originates from the vision that anyone who wants to add value should not be hindered (MeatballWiki: SoftSecurity, 2007).

- *Username*
  Most wikis give its users the option to create an account for the wiki. This way all the changes a person does will be associated with his or her account's username. Some wikis

aren't editable or even visible to anonymous users, forcing users to create an account to participate.

- *Notifications*
  Some wikis gives the users the option to receive notifications by e-mail on changes to pages they chose to subscribe to.

3.2. Theory: Focus

In this chapter we will introduce four perspectives that we seek insight into to identify key aspects of importance when introducing a wiki in an organisational environment. This theory is later to be verified in the Discussion of our thesis.

3.2.1 Organisational Culture

Culture is the first of four perspectives that will be examined on the quest to identify key aspects. This section is about the cultural aspects of knowledge creation and sharing, and what can be done to create a supportive organisational environment. The initial part of this section will be aimed at culture in an organisational context, whereas the ending part will try to bridge the traditional view of organisational culture into a virtual context.

Many authors believe that a supportive culture is essential to achieve benefits from KM. In 1997, Davenport wrote about Information Ecology where they put the users in the driving seat of IT-usage. They argue that in order to succeed in the usage of IT-systems, it is necessary to draw attention to the behavioural and cultural dimensions of IT usage. Gartner Group, the information and technology research and advisory firm, also highlighted the importance of these cultural dimensions the same year:

> *Enterprises with cultures that systematically limit or inhibit capability, autonomy, and responsibility, as well as those in which sharing of knowledge is actively discouraged either by official or unofficial policy, will find that investment in KM technology provides (relatively) minor operational efficiencies at best* (Bair, Fenn, Hunter & Bosik, 1997).

De Long and Fahey (2000) continued in the same direction and stated that culture creates the context for social interaction that ultimately determines how effective an organisation can be at creating, sharing, and applying knowledge. The authors further stated, the perhaps most central reason at all for emphasizing the importance of trust, that culture and particularly subcultures shape our assumptions about what knowledge is, and by that also which knowledge is worth managing.

Before we continue with this theoretical review centred on culture, it would perhaps be in place to position the abstract notion of culture:

> *Culture can be thought of as: (1) A pattern of basic assumptions, (2) invented, discovered, or developed by a given group, (3) as it learns to cope with its problems of external adaptation and internal integration, (4) that has worked well enough to be considered valid*

and, therefore (5) is to be taught to new members as the (6) correct way to perceive, think, and feel in relation to those problems (Schein, 1988).

Cultural Perspectives of Knowledge Management

There seems to be a common understanding among researchers that in order to succeed as a knowledge creating and sharing organisation – care must be taken into consideration (Davenport & Prusak, 1998; von Krogh, 1998; Ardichvili, Page, & Wentling, 1999). To enable effective knowledge creation, it is important to understand how people relate to each other in a company. The ideal case is to have a culture that fosters constructive relations, which speed up the communication process – a process that enables employees to share their personal knowledge and to discuss their ideas, and concerns freely (Von Krogh, 1998).

Von Krogh (1998) further believes that good relations can most often remove hindering obstacles in the knowledge creation process like distrust, fear, and dissatisfaction. The remaining environment should stimulate employees to feel confident and free enough to be ready to take on new challenges and explore new territories.

The same authors further suggest that when care is established it gives rise to trust and active empathy, which transforms into real help and lenient judgment among employees. Care will also have the effect of encouraging employees to voice their opinions or give feedback as part of the process to helping others. It might also inspire employees to develop relations that include a greater deal of courage, which is necessary to remove the personal insecurity that the seeking of a new experimental solution might attract.

To further clarify what care is will we describe a scenario when care is low suggested by Von Krogh (1998). When care is low individuals will learn to solve problems by themselves and since the environment lacks care voluntary sharing of knowledge will consequently not occur. The lack of evaluation of those skills will also slow down the entire knowledge creation process. Even though employees will learn new skills the evaluation of these skills will lack multiple feedbacks and that will slow down the entire knowledge creating process. In this careless scenario no benefits can be gained by cooperation and other employees are thus simply regarded as obstacles. As a result, initiatives to present new concepts or prototypes will be met with a brusque, austere attitude and harsh judgment by other participants. When forced to cooperate employees will try to defend their own knowledge and listening to others is regarded as a waste of time. In this competitive context, sharing more knowledge than necessary will lead to reduced power and influence. Thus motivation to share is low and when sharing occurs is it regarded as a transaction where knowledge shared is being based on expected returns.

On the other hand, there are ways in which the organisations can act to increase the likelihood of care. Von Krogh (1998) suggests that introducing mentor programs may create care by providing guidance and recommendations for courses of action and behaviour. He also believes that it is important that trust, openness, and courage are values that are explicitly stated by top management. The author further claims that programs in care-based behaviour or social events might also stimulate to good relations.

Trust is another factor that researchers claim is important in a KM context (Davenport & Prusak, 1998; De Long & Fehey, 2000). Trust can be defined as follows:

> *The willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trust, irrespective of the ability to monitor or control that other party* (Mayer, Davis & Schoorman, 1995).

Further, Davenport and Prusak (1998) claim that without trust knowledge initiatives will fail regardless of how thoroughly they are supported by technology and rhetoric. The researchers believe trust can be established in three ways. First they suggest that trust must be visible, second that trust must be ubiquitous, and third that trustworthiness must start at the top.

De Long and Fehey (2000) also suggest that organisations need to make organisational expectations and procedures transparent through clear and widely accessible communication of these expectations and rules. Even though clear and transparent communication is important, is the impact in isolation not enough. Therefore is it important that the organisation as a whole must demonstrate that it trusts its employees.

Another factor that ought to get attention in this domain of factors that has an impact on KM performance is motivation (Ardichvili et al, 2003). De Long and Fahey (2000) claim that culture and particularly sub-culture shape the assumption of what knowledge is. Therefore as suggested by Ives, Torrey and Gordon (2002), should the challenge of motivation be aimed at understanding how to motivate different subcultures that may lack shared meanings and values.

Knowledge Sharing

Sharing information is the voluntary act of spreading information and is therefore not the same as reporting (Davenport, 1997). Davenport (1997) believes that one of the reasons why information sharing is ever so important is the need for cross-functional cooperation.

There are numerous reasons why employees don’t want to share what they know and factors that can slow down the flow of knowledge throughout the organisation. Von Krogh (1998) and Ives et al. (1999) advocates that the inter-competitive environment in many organisations fosters knowledge hoarding. In these firms unique possession of knowledge is seen as power and job security.

Davenport (1997) further addresses that sharing of information might also result in negative feedback if the shared information is responsible for causing damage to the organisation or its employees. The author further claims that the sharer of information might also run the risk of being forced to give time-consuming support to answer further questions generated by the shared information. Another reason might be as simple as there is not enough time to contribute (Dixon, 2000). The uncertainty of not knowing to what purpose the information will be used can also be reason to why employees don’t want to share information (Davenport, 1997).

There might also be barriers when it comes to give knowledge to or accept it from people in the organisation who have relatively low status (Davenport & Prusak, 1998). The "that's not my job"-

attitude might also endanger effective sharing of knowledge (von Krogh, 1998). Finally, different vocabularies and frames of reference can slow down the process of sharing knowledge (Davenport & Prusak, 1998; Ives et al., 1999; Hahn & Subramani, 2000).

To enable organisations to create an environment that fosters knowledge creation is it important with well-defined knowledge capture processes so that everyone should know where and how to contribute new knowledge and what happens to it after their contribution is made (Ives et al., 1999; Davenport & Prusak, 1998).

Ives et al. (1999) further believes that when organisations realize the importance of knowledge creating and sharing they may also reflect upon the performance of these processes. Processes that may need training and ongoing support to deliver the desired results.

Even though employees can be learned how to act in certain ways to create a facilitating knowledge fostering environment, the organisation will fall short if it's leaders lacks the skill to practice genuine leadership behaviour. Only then can organisations be socialized to become knowledge sharing competent (Ives et al., 1999).

Virtual Culture

Usage of the wiki concept as a foundation for KM affects knowledge creation and sharing in new ways. First off, the mere possibility to share knowledge in a virtual context may have a positive impact on knowledge sharing because when employees realize the benefits of being able to ask others for help, the outcome may be the legitimisation of sharing as well (Dixon, 2000). Further on, when information gets digitalized, information can spread more easily which facilitates that more people can take part in the reviewing of the information. This is a great possibility that can lead to professional recognition but it also puts higher pressure on the submitter of information. If the information is misinterpreted or simply incorrect, it is possible that the resulting damage gets massively amplified. This is a new kind of exposure for many employees compared to an ordinary none IT-based situation where information creation and sharing happens within a limited number of individuals. Therefore it is important to acknowledge the amplification of consequences that are tied to knowledge creation and sharing in a virtual context, and to examine how they can be managed.

The significance of trust can also be found in virtual knowledge sharing communities of practices. Research by Ardichvili et al. (2003) suggests that participants were less hesitant to post information in a virtual context once they trust that the other members will not misuse the posted information in ways that could harm the contributor in different aspects such as: (1) taking undue advantage of confidential information, (2) advancing one's personal agenda at the expense of the organisation or other members, (3) or using the posted information to personally attack those who posted it, challenging their professionalism.

Being in a virtual context, employees without previous relations might have to cooperate to solve organisational problems. This may be a contradictious situation, they are on one hand regarded as complete strangers towards each other; and on the other hand will they need to trust each other in order to facilitate exchange of thoughts (Von Krogh, 1999; Davenport & Prusak, 1998). One answer might be found in Zucker's study about initial trust (Zucker, 1986 - referred to by

McKnight et al, 1998). Institutional-based trust means that one believes impersonal structures support one's likelihood for success in a given situation. Or described in a perhaps more concretised way, that employees put trust in the organisation as a whole to be able to protect employees from harmful acts by other employees and that there are sufficient resources within the company to solve relevant problems (Ardichvili et al, 2003).

Since the employees' trust in the organisation is fundamental in a virtual context, is it important that the organisation takes actions to support trust. This suggestion aligns well with previous mentioned cultural design implications bringing forward that the organisation clearly should promote in which ways the employee can contribute, and what kind of behaviour that is expected by the organisation (Ives et al., 1999; Davenport & Prusak, 1998; Ardichvili et al, 2003; De Long & Fehey, 2000).

Continuing on the list of important aspects of a virtual culture is another reoccurring theme - motivation. Ardichvili et al. (2003) believes that one of the critical factors determining a virtual community's success is its members' motivation to actively participate in community knowledge generation and sharing activities.

Majchrzak, Wagner and Yates (2006) seek further light into motivational aspects regarding why individuals contribute to online communities. In an organisational context they claim that the key motivational factor tend to be concentrated around improving work, whereas in a non-organisational online community on the other hand the researches suggest that aspects such as anticipated reciprocity and improved reputation are of greater importance.

Anticipated Reciprocity is the expectancy that the information will be useful for others and that one will receive useful help and information in return (Kollock, 1999). The author further claims that anticipated reciprocity is related to individual reputation in a online community since studies has shown that members that are more active get more responses in a shorter period of time than unknown members.

Reciprocity may also occur within a group as a whole in a system of generalized exchange, which creates a kind of credit. A credit in the sense that one can draw upon the contributions of others without needing to immediately reciprocate. This is an advantage, as the group as a whole is better off if each individual shares information without restraints. This loosely based contribution system kind of serves as insurance, in that one can draw from the resources of the group when in need, without need to immediately repay each person (Kollock, 1999).

Contributions may play an important role in improving personal recognition in an online community. Contributions of high quality information, impressive technical details in one's answers, a willingness to help others, and elegant writing can all work to increase one's prestige in the community. Individual contributions are likely to increase when the contribution is visible for the other members of the community and that they recognise contribution. Helpful acts are also likely to be recognised by the group as a whole (Kollock, 1999).

3.2.2 Wiki Perspectives

In this section we will investigate three different perspectives of the wiki concept: content, structure and functions.

3.2.2.1 Content

The content of a wiki is based on the users' participation. It is the users of the wiki that defines what kind of information that should be published in the wiki, regarding in which context it resides and how it should be structured. This call for the content of the wiki to be correct, so that other users can rely on that the information is correct. The issue of information correctness is one of the core issues of the wiki concept. Since the wiki is a tool based on openness the issue of information correctness must be widely discussed before implementing a wiki. One of the advantages of the wiki concept is its up-to-date information, which in turn can make the correctness of information to take one step back. Alavi and Leidner (2001) claim that the more readily available the knowledge is, the more likely its reuse. In other words: the fast and dynamic nature of the wiki makes the content useful. But on the other hand, as Alavi and Leidner (2001) describes it; the more readily information is available, the greater the likelihood of knowledge misuse, i.e., knowledge being misapplied to a different context. Furthermore, they point out that today's knowledge may be tomorrow's ignorance in the sense that knowledge emerges (Alavi & Leidner, 2001). It is important to have a well-balanced view of dynamic nature of the wiki, and the risk of information being incorrect.

The possibly most important issue regarding the content of a wiki is the overall question about what information that should be published in the wiki. Stewart (2002) describes how companies waste billions on KM because they fail to figure out what knowledge they need, or how to manage it. Further, Stewart claims that KM resources go unused for one simple reason, that they are not useful:

> *Either the work isn't connected to the knowledge or the knowledge isn't connected to the work* (Stewart, 2002).

Stewart (2002) further explains the necessity of carefully selecting what kind of knowledge should be managed. Stewart uses the following example to explain why this is important:

> *Just as managing a business depends on deciding what business you are in -- General Motors builds cars, not parking lots, gas stations, or highways -- so KM must begin by selecting the knowledge to be managed. It's no good assembling a library full of everything anybody could conceivably want to know about everything (Stewart, 2002).*

To know what information is relevant and useful to have in a wiki, the first thing to do is to investigate what kind of information the users find useful and what they think should be placed in a wiki. A wiki should obviously have a big relevance to its users and this is a big issue since different communities have different contexts. It is important that the information published in a wiki reflects the domain of its users. Hahn and Subramani (2000) claim that in the light of the dynamic process of knowledge creation, linkages between individuals and groups sharing similar tasks – the communities of practice – play an important role in communicating and sharing knowledge. Furthermore, Hahn and Subramani (2000) say that as communities have their own

unique and context specific vocabularies, while facilitating knowledge exchange within the community, this impedes communication between them. Hahn and Subramani's (2000) opinion is that the overlapping of understanding provided by boundary objects spanning multiple communities provides a basis for communicating, sharing, resolving, and combining disparate perspectives.

Stewart (2002) says that one flaw in KM is that it often neglects to ask what knowledge to manage and towards what end. He says that no one claims the big question of why. Based on this, Stewart (2002) has formed a number of fundamental questions that aids in the process of investigating what information should be of relevance to be published in a KM tool, such as a wiki. The questions that need answers are:

1. What is the work group?

2. What does the group need to know?

3. Standardize or customize?

The first question is about selecting which group of people that will use the KM tool. By selecting which group will use the KM tool, one can place primary responsibility for which content is relevant in the group. The group will by this responsibility define which content is relevant. The group can be of a differentiated kind, such as cross-functional project teams that need a common knowledge space. By having a differentiated group it will create a shared information base. Hiltz and Turoff (1985) say that one issue to discuss is the reach of the KMS, both in terms of size of the user group and diversity of the group. The authors describe that this is an important issue because increases in the size and the diversity, while beneficial, involve an implicit trade-off between irrelevant content and potentially useful information. Furthermore, Hiltz and Turoff (1985) explain that if the reach of the system is too broad, then the system run the risk of becoming overloaded with irrelevant information. Deciding on an appropriate size and scope has an impact on the strength of the weak ties.

The second question one should ask is what the group needs to know, i.e. their information needs. To find out what kind of information that is of use for the group, one should start by interviewing the group members. By finding out their needs, how they use information, and how it better can aid them in their working process, the KM tool is more likely to be used to a greater extent. When interviewing the group members the issue of context may arise. According to Alavi and Leidner (2001), an important consideration when storing knowledge is how much context to include. Alavi and Leidner (2001) say that when the context surrounding knowledge creation is not shared, it is questionable whether storing the knowledge without sufficient contextual detail will result in effective uses. This could lead to the essence of the knowledge being lost (Alavi & Leidner, 2001).

The third question that needs an answer concerns the objective of the KM-tool. Should it be based on a view of standardised information, in other words use knowledge as a knowledge repository, or should it be a base for creativity, hence used as a sort of communicating tool of ideas? Stewart (2002) emphasis on being clear about the objective of a KM tool, and explains that for a company that reuses knowledge, reinventing the wheel is a major negative aspect. That's

why it's crucial to be clear about the purpose of a KM tool, such as a wiki. Hence, there is a need to in an early stage define the purpose of the wiki and share a vision of what's it for. This has an impact on the wikis overall successfulness and is a key issue to deal with.

3.2.2.2 Structure

> *Navigation, orientation and search are often problems. This occurs when the wiki reaches a high amount of pages* (Buffa, 2006).

The wiki gives the organisation an opportunity to put knowledge into a system, making it a tool for KM. The important gain of this knowledge is given through information retrieval. For wiki users to access the knowledge, it needs to be structured in a way that makes information retrieval as effective and easy as possible. The basic foundation of a wiki is just plain pages with no structure between them. The pages are linked together using hyperlinks, which create a flat structure. At this point the retrieval is only possible through direct bookmarks to certain pages and navigation between pages using hyperlinks. A basic functionality at this level would be to introduce a search utility, which is the main way of information retrieval on wikis. A study made on wiki usage in France, interviewing users from a university as well as an enterprise, showed that the main problem for the users was related to the wiki's the open structure. It makes navigation, orientation and search sometimes difficult. This occurs when the wiki reaches several thousand pages. Search is becoming less and less useful as the wiki document base grows (Buffa, 2006).

Hierarchy and Spaces (taxonomy)

To better support the conceptual model of the organisation, the wiki can be structured according to the taxonomy of its environment. This would add a hierarchy to the content of the wiki reflecting on the organisation's hierarchy and/or present taxonomy.

> *Trees are neat; piles of leaves are messy* (David Weinberger, 2007).

The larger the amount of information in a wiki, the greater is the need for structure. A wiki structure based on its environment will support the browsing of information and make it more feasible for the users to work within it, since the structure is close to their view of how the information should be structured. There is also a need for different areas within the wiki, for example Wikipedia has different sections for different languages. In organisations the sections can be divided into different departments to ease the understanding of where you are. Many organisations are too complex for just one wiki – each team needs its own space (Atlassian Confluence, 2007). Spaces will create structure while being transparent (Buffa, 2006). The large newspaper The New York Times worked with a wiki without the use of different spaces, and as the number of pages and users grew, several problems arose. Page names had to be different since there was no hierarchy; after two years the users had to try several different names before finding one that hadn't been used, making page names often unusable for other users since it had little or no logic in the naming convention. The structure of the company didn't reflect the structure of the wiki (Buffa, 2006). Search tools can with the help of a hierarchy make more directed searches in different areas.

Tagging

Using only hierarchy to categorise information can lead to problems, one example is information suitable for more than one place in the hierarchy. In practice, categories are often not well defined and their boundaries exhibit vagueness (Labov, 1973 - referred to by Golder & Huberman, 2005). Items often lie between categories or equally well in multiple categories. The lines one ultimately draws for oneself reflect one's own experiences, daily practices, needs and concerns (Golder & Huberman, 2005). These problems require a way of adding several different categories to information; this is where tagging can help the wiki.

Another way of adding value to different kinds of information is to add metadata to them. Metadata is easiest described as data about data, for example adding information about the author of a document and what the information category of that document might be. A phenomenon emerging from websites such as Flickr and del.icio.us is folksonomy - a user-generated classification, emerging through bottom-up consensus. Users can put metadata to different kinds of information (pictures, bookmarks, documents etc.) in the form of tags in a simple manner. The users associate keywords with content (Quintarelli, 2005).

Folksonomy is a combination of the words folks and taxonomy, referring to the fact that the taxonomy in this case is based on the actual users (folks) instead of a top-down approach found in taxonomies. An important aspect of a folksonomy is that is comprised of terms in a flat namespace: that is, there is no hierarchy, and no directly specified parent-child or sibling relationships between these terms (Mathes, 2004). Overall, although the term "classification" is often used in relation to these systems, what is going on is more like "categorization" (Mathes, 2004). Categorization is generally less rigorous and boundaries are less clear. It is based more on a synthesis of similarity than a systematic arrangement of materials (Jacob, 2004 - referred to by Mathes, 2004). A folksonomy represents a fundamental shift in that it is derived not from taxonomy professionals or content creators, but from the users of information and documents. In this way, it directly reflects their choices in diction, terminology, and precision (Mathes, 2004). Tags reflect the way the users actually relate to certain content, making browsing of tags more likely to generate information close to what the user was looking for. Since folksonomies are user-generated and therefore inexpensive to implement, advocates of folksonomy believe that it provides a useful low-cost alternative to more traditional, institutionally supported taxonomies or controlled vocabularies. An employee-generated folksonomy could therefore be seen as an "emergent enterprise taxonomy". Some folksonomy advocates believe that it is useful in facilitating workplace democracy and the distribution of management tasks among people actually doing the work. Once you have a preliminary system in place, you can use the most common tags to develop a controlled vocabulary that truly speaks the users' language (Merholtz, 2004 – referred to by Mathes, 2004). Groups of users do not have to agree on a hierarchy of tags or detailed taxonomy; they only need to agree, in a general sense, on the "meaning" of a tag enough to label similar material with terms for there to be cooperation and shared value (Mathes, 2004).

While professionally created metadata are often considered of high quality, it is costly in terms of time and effort to produce. This makes it very difficult to scale and keep up with the vast amounts of new content being produced (Mathes, 2004). Building, maintaining, and enforcing a sound, controlled vocabulary is often simply too expensive in terms of development time and of the

steep learning curve needed by the user of the system to learn the classification scheme (Quintarelli, 2005). While there are many positive aspects of folksonomies, some aspects of putting the users in charge can be destructive to the actual relevance of tags. Both tagging systems and taxonomies are beset by many problems that exist as a result of the necessarily imperfect, yet natural and evolving process of creating semantic relations between words and their referents (Golder & Huberman, 2005).

A polysemous word is a word that has many ("poly") related senses ("semy"). For example, a window may refer to a hole in the wall, or to the pane of glass that resides within it (Pustejovsky, 1995 - referred to by Golder & Huberman, 2005). This leads to related but potentially inapplicable items. Polysemy is similar to homonymy, where a word has multiple, unrelated meanings. However, homonymy is less a problem because homonyms can be largely ruled out in a tag-based search through the addition of a related term with which the unwanted homonym would not appear (Golder & Huberman, 2005).

Synonymous words can cause problems by excluding information tagged with a synonym making it difficult to know if all relevant items have been found. It is difficult to be consistent in the terms chosen for tags; for example, items about television may be tagged either *television* or *TV* (Golder & Huberman, 2005). A related problem to synonyms is words in plural, when looking for *cat* some items are labelled with *cats* for example. Other similar problems include variant spellings of the same concept (American versus British) and choice among scientific and popular terms (*Cockroaches* versus *Periplaneta Americana*) (Wikipedia: Controlled vocabulary, 2007). It's important for an organisation to attend to these problems.

Another problem is the "basic level", related terms that describe an item varying along a continuum of specificity ranging from very general to very specific; as discussed above, *cat*, *cheetah* and *animal* are all reasonable ways to describe a particular entity (Golder and Huberman, 2005). For the purposes of tagging systems, conflicting basic levels can prove disastrous, as documents tagged *Perl* and *JavaScript* may be too specific for some users, while a document tagged *programming* may be too general for others.

Tagging is fundamentally about sense making. Sense making is a process in which information is categorized and labelled and, critically, through which meaning emerges (Weick, Sutcliffe and Obstfeld, 2005, referred to by Golder and Huberman, 2005).

By incorporating a set of tags in line with an organisation's taxonomy in combination with popular tags from users, these tags can be used as suggestions to the users as they add tags. This will maintain a useful set of tags within the wiki, and hopefully only adding new tags that the users regard as useful.

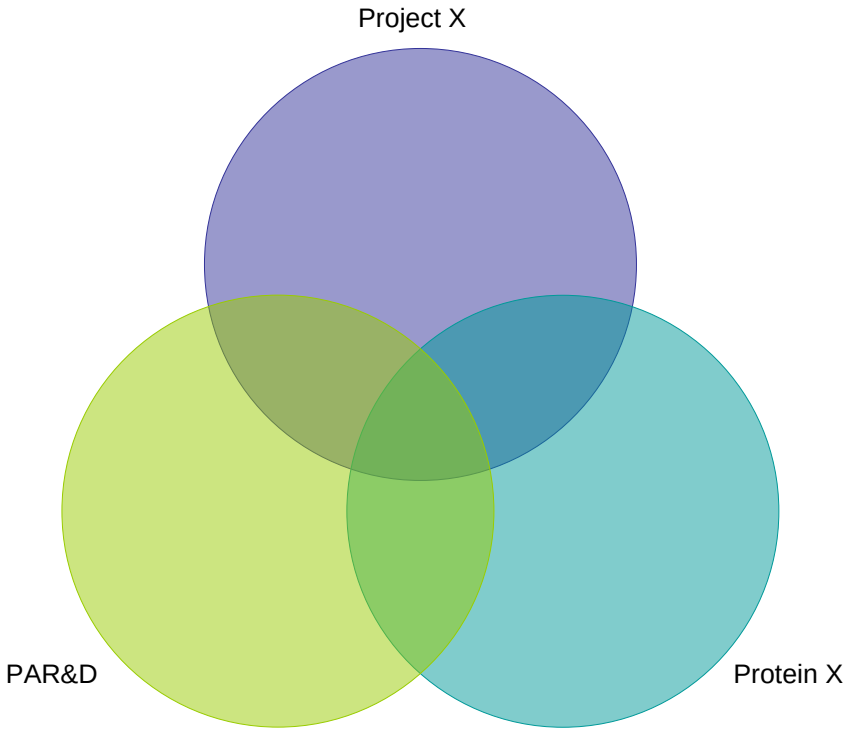

Figure 8. Three different tags resulting in an answer through tag-search.

Semantic Web and Wiki

The Semantic Web is a project that intends to create a universal medium for information exchange by giving meaning (semantics), in a manner understandable by machines, to the content of documents on the Web. Currently under the direction of its creator, Tim Berners-Lee of the World Wide Web Consortium, the Semantic Web extends the ability of the World Wide Web through the use of standards, mark-up languages and related processing tools (Wikipedia: Semantic web, 2007).

> *The Semantic Web is not a separate Web but an extension of the current one, in which information is given well-defined meaning, better enabling computers and people to work in cooperation* (Tim Berners-Lee).

The difference between adding metadata through folksonomy and semantics is that folksonomies add tags outside of the actual item using tags, while semantics is used within the data of an item. Semantically rich data, i.e. information annotated with metadata (Aumüller, 2005). The concept of The Semantic Web is also interesting for structural purposes within the concept of the wiki. One way to organise the organic growth of wiki content is to add structure by enriching wiki-pages with additional metadata (Decker et al., 2005). The main idea is to make the inherent structure of a wiki – given by the strong linking between pages – accessible to machines (agents, services) beyond mere navigation. Only humans are able to read and understand the texts contained in the wiki – for machines, without sophisticated processing the only thing visible of the knowledge contained within the wiki is a large number of text pages which link to each other (Decker et al., 2005). This is generally done by annotating existing navigational links with

symbols that describe their meaning. For example, a link from *Mozart* to *Salzburg* could be annotated with lived in or born in (Schaffert, 2006). If further metadata would be added, for example Mozart's birth date and occupation, a query for 18th century composers living in *Salzburg* would result in a list containing Mozart, and of course other matches to that specific query. A page with information about Mozart would probably include his birth date, but like mentioned above, this information is not something the computer can interpret on its own, a user needs to add this as metadata – for example: *Mozart was born in [YearOfBirth: 1756]* would look like *Mozart was born in 1756* to the reader while adding useful information in the form of metadata.

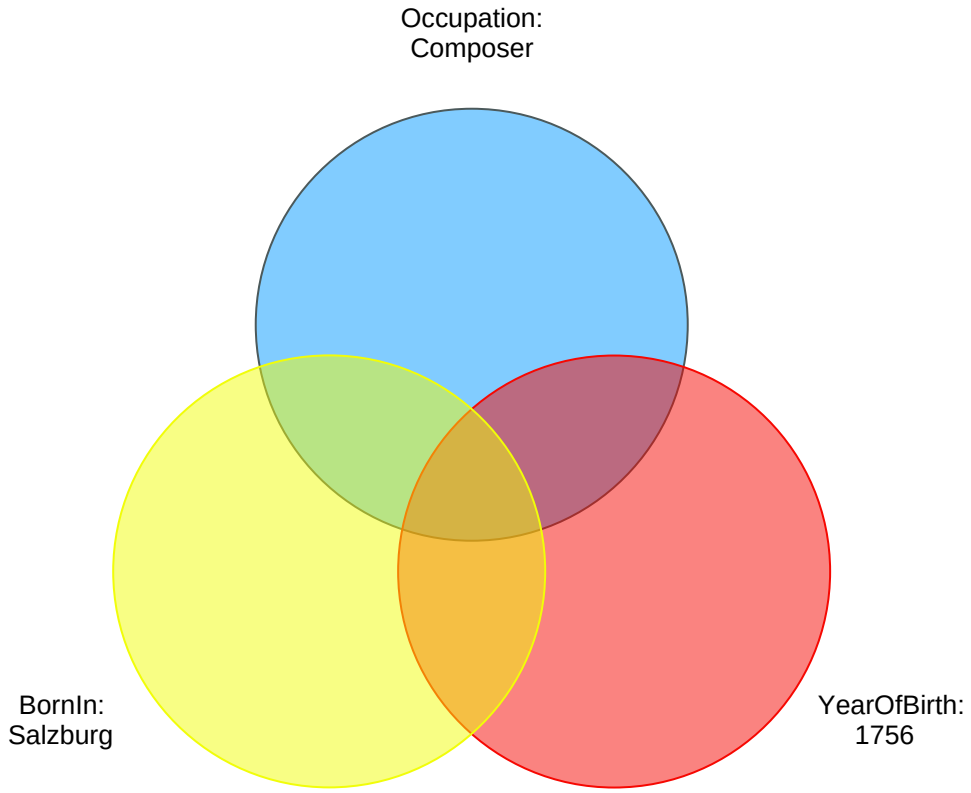

Figure 9. Three different attributes resulting in an answer through query.

Providing structured queries is a strong advantage of incorporating a semantic structure to the content, but it also provides technology that can collect information and present it in different templates according to which area of knowledge the information resides. Pages with similar content – for example pages about different compounds can have a structure based on collecting important information regarding that domain. Also, by creating a page being a compound, this will automatically add a link to that page on another page listing all compounds.

The key factor of a wiki is its ease of use; building a wiki that support scalability makes structure necessary. The problem lies between these two factors, because incorporating a working structure, with semantics in this case, is far from easy and as domain experts are usually non-technical people, ease of use is of big importance (Schaffert, 2006). Creating semantically rich

data bottom-up is tedious (Aumüller, 2005). It's important to maintain the ease of use throughout the whole system.

As a rule of thumb, an "absence of semantics" is close to "an absence of structure", and typically leads to what people call information overload when they are searching for specific information due to the lack of filtering based on these semantics (Decker et al., 2005).

3.2.2.3 Functions

The most prominent function in the wiki is that it enables its users to create and edit pages. The content in a wiki is edited via a simple browser interface that can be used without installing any additional software, which might be expensive. The easy-to-use graphical user interface (GUI) in editing mode has the functionalities comparable to basic text editors. Its functions include creation of different types of headings and other formatting of the text. Many wikis have taken the WYSIWYG (What You See Is What You Get) approach into use, which basically means that the editing process is simplified by representing functions with icons. Studies show that the WYSIWYG-approach is successful when implementing a wiki in an organisation (Lorentzon et al., 2006). The above-mentioned features make the wiki an ideal tool for sharing knowledge and to carry out collaborative editing (Schaffert, 2006). As soon as a user creates a page of information, other users can contribute by extending the information or correct it (Schaffert, 2006). Many wiki systems provide further support for collaborative editing, e.g. by means of discussion forums, summaries of changes, and lists of last updates (Schaffert, 2006).

Lindström (1999) addresses the need for an easy-to-use graphical user interface. He claims that the insight in the users' view of the graphical user interface is what is going to determine if a system will help the user. Furthermore, the author says that the user interface and navigation should be intuitive and easy to use. This especially applies to a wiki, which is founded around the users' participation. Lindström (1999) claims that an essential aspect is the users' mental model of a new system, as this may not be aligned with the designer's mental model of the system. In accordance to this it is necessary that the navigation functionality is attractive, robust and easy to understand (Lindström, 1999). Further, the author claims that poor navigation opportunities can be prevented by having a more central and structured approach, and by having a proper search function. Hellström (1999) emphasises on keeping navigation logical, and that the navigational possibilities should be placed in a logical order. Furthermore, the author claims that it may be difficult to navigate in a system if the connection between the navigation and the reality isn't obvious. Also, if the system is too big, there may be difficulties to understand where one is positioned in the system, and this problem relates to the use of several menus on several different levels. Hence, navigation in information systems such as a wiki can be time-consuming and this may be prevented by organising the content logically in hierarchical levels, without the use of too many menus. This addresses the issue of having an easy-to-use graphical user interface in the wiki, with intuitive navigation opportunities.

Wikis enable the use of anonymity and the possibility to disable it. Schaffert (2006) describes that in most wiki systems, access is completely unrestricted which mean that anyone can correct, modify, complete, or even delete anything. Furthermore, Schaffert (2006) says that while this might seem strange, and even dangerous, from a traditional perspective, practice shows that the

system works: on the one hand, ill meaning users are rather rare. All changes can easily be undone using the wikis embedded change log feature (Schaffert, 2006). Changes to the content of a wiki are versioned each time they are stored, i.e. previous versions of pages are kept (Gonzalez-Reinhart, 2005). This allows to revert back to earlier versions of a page e.g. in case important parts have been accidentally deleted or undesirable modifications have been made by someone else (Gonzalez-Reinhart, 2005). Schaffert (2006) further says that some wikis still allow applying further access restrictions as found in traditional content management systems. As a KM tool, the wiki is based on the users' willingness to share information with each other. The content should therefore, to support the knowledge sharing process among the users, be open for alterations. Despite a wikis open nature there are different possibilities to restrict the access to its content. The wiki as a KM tool encourages openness and sharing, and this may inflict a conflict with the use of restrictions. Before implementing a wiki one should therefore carefully consider the issues related to the use of anonymity and restrictions.

4. Results

In the previous chapters we introduced theories from literature in the KM-field. In this chapter we will focus on the results from the two different interviews we performed. The purpose of the first interview phase was foremost to create a foundation for design decisions regarding the wiki pilot's structure and what content to have in it. In the second interview we wanted to evaluate the wiki usage to see if the users' view of the wiki concept was aligned with the theories regarding key aspects when introducing a wiki in an organisation, which can be found in Theory: Focus.

4.1 The Setting

In this section we will give a short introduction to AstraZeneca, the pharmaceutical industry and the concept of knowledge organisation.

4.1.1 AstraZeneca

The pharmaceutical company AstraZeneca was formed in 1999 when Astra AB of Sweden merged with Zeneca Group PLC of the UK. The two companies had similar science based cultures, and became one of the world's leading pharmaceutical companies. Currently, AstraZeneca primary business is discovery, development, manufacturing, and marketing of prescription medicines for patients. The medicines are in the area of cancer, gastrointestinal etc. The company has products in over 100 countries and around 65000 employees. The headquarters are in London, UK, with the R&D headquarters in Södertalje, Sweden.

The organisation of AstraZeneca is a matrix structure, where project management and line management are different components (Roth, 2003). The project environment in the company does not per se support knowledge transfer between projects (Roth, 2003). There have been many initiatives over the years to make AstraZeneca work in a uniform way and to have similar routines in the research and development (R&D) projects. Despite the efforts of these initiatives, the working routines and how to create knowledge seem to differ from project to project in R&D (Roth, 2003).

The most common tools for managing knowledge today in AstraZeneca is the intranet, which is called InfoSpace, and the project tool eRoom. The intranet displays organisational news, enables the user to create a personal page, and handles some basic functionality regarding search in knowledge databases. The eRooms are used when storing and communicating information related to a particular project. Restrictions to the eRooms can be applied so that only the members of the project have access.

4.1.2 The Pharmaceutical Industry

To gain of a competitive advantage in the pharmaceutical industry is closely connected to an organisations ability to generate new knowledge (Roth, 2003). This knowledge is transferred into patents and new medicines, which then is converted into marketable products. The process of generating and documenting a new medicine is both very resource and time-consuming, with

only a fraction of the molecules tested becoming an actual sellable product on the market (Roth, 2003).

Before eventually being sellable on the market, the drug is toxicology tested, pre-clinical tested, and clinical tested (Roth, 2003). When these tests are made the drug needs regulatory approval, to meet a number of requirements from governmental and international standards committees (Roth, 2003). The development phase all have different requirements regarding knowledge and competence (Roth, 2003).

4.1.3 Knowledge Organisation

The term knowledge organisation can be somewhat ambiguous, in that it can mean two different things in different contexts. First of, it can mean an organisation that recognises the value of knowledge and implement strategies to enhance and leverage that knowledge. This viewpoint of the concept is what is discussed in this section. The alternate use of the term knowledge organisation literarily means organisation of knowledge, with focus on arrangement of knowledge. This alternate term of knowledge organisation is used to describe the facilitation of documents or other kinds of recorded knowledge (Hjørland, 2007).

The concept of knowledge organisation appeared in the early 1990s and was used to describe particular kinds of adaptive companies in the service industry. To be more specific, the concept described organisations with a business logic that was focused on the matching of creative effort and the capacity to customer problems. In the early 1990s these knowledge organisations were characterised as being small, knowledge intensive, highly educated and based on an ad-hoc structure (The knowledge organisation – Does it really exist?, 2007).

But the meaning of the concept knowledge organisation has shifted since then. The concept has been widened and can today be applied to organisations in all kinds of industries. The concept of knowledge organisation can nowadays be defined as an organisation that recognises the primary value of both explicit and tacit knowledge within its workforce, and implements strategies to enhance and leverage that knowledge (The knowledge organisation – Does it really exist?, 2007).

4.2 Results from the First Interview Phase

To decide on the design of the wiki pilot's structure and content, we tried to acknowledge aspects such as how the interviewed individuals currently searches information, how difficult it is to find information, how the information search process can be enhanced, and which IT-tools they use in the information search process. The interview phase one was based on a semi-structured approach and the interview layout can be found in Appendix 1 in the thesis. We have gathered a collection of issues and opportunities that was raised by the interviewees. In the last part of this section we will develop the actual design of the wiki pilot's structure and content. That in turn implicates that the ending part will include material that is not empiric results and we therefore feel the need to explicitly address this matter.

4.2.1 Issues

The issues when searching for information that has been addressed by the individuals can be divided into two categories: general issues and current information systems issues.

General Issues when Searching Information

The most common issue addressed from the users was to reach and recover the information and experience that each employee has. Several of the individuals acknowledge that a lot of knowledge is to be found in the mind of the employees, which would be useful for other individuals and for the organisation as a whole.

> *It's difficult to know what has been done before, for example experience, projects. This kind of information is easy to miss and the consequence is to re-invent the wheel several times over.*

One of the persons we interviewed said it would be valuable to collect more soft information but still, at the same time, keep a high quality. Another individual agreed that more information about projects, e.g. to know what individuals in projects do, would be valuable.

Several of the interviewed individuals addressed the issue of the information that has been documented, the information that has been captured, is not used in a satisfactory way. This since there are no guidelines regarding how to find relevant information. There seems to be different course of actions depending on which individuals are involved. Each project and AstraZeneca's different sites around the world publishes their documents in accordance to different procedures, which makes information retrieval very difficult, says one person we have interviewed. Another individual recognises this issue, and says that it is important not to waste time on things that doesn't give value in return. The respondent further describe that the biggest issue is to systemise the information. To distribute information to the right individuals in a sufficient quantity is the issue rather then to specifically find the information, the respondent argues.

An important issue addressed by a couple of the interviewees is the fact that failed projects doesn't get documented as extensive as successful projects. This is a big problem since one could learn and make conclusions from the failed projects. One interviewed person says this has to do with the culture of AstraZeneca. The respondent claims that the organisational culture makes individuals afraid of discussing failures and that there is a prestige to impress each other which works in a negative way on the information exchange.

A common issue that all of the respondents acknowledge and which comes into light under the interviews is the lack of time. In their daily work there are lots of different tasks that must be done which naturally take time away from finding information.

The issue of security was also discussed during the interviews. This is an important issue for AstraZeneca and for all companies in the pharmaceutical business. It is important to thoroughly think about and investigate how to restrict the access to documents and information, foremost when it comes to patents.

In general, the most common way of searching information today is, according to several of the interviewed persons, to physically go and talk to the individual next door. The person next door then hopefully knows more or can guide to another person who knows the relevant information. This way of searching information is the primary choice for the majority of the individuals we have interviewed. It is both time-effective and easy. If this approach towards finding relevant information doesn't work, the next step is to look up information in the computer and different software, which is filled with information. To search information on the computer is often time-consuming and it's difficult to find relevant information.

Current Information Systems Issues

There are several issues regarding the current information systems at AstraZeneca, which makes the process of finding relevant information difficult, according to the individuals we have interviewed. First and foremost, several of the respondents' states that the threshold of learning a new information system must be low; as it shouldn't be filled with difficulties for the users. The complexity of the information systems prevents the users from using the system.

> *The systems must be easy, quick and show clear usefulness*.

Especially the company's intranet, InfoSpace, is criticised by the individuals we have interviewed. For example, it is difficult to find information on the intranet as it doesn't have a clear structure and uses complex headings. The intranet is slow and everything looks the same which makes it difficult to know where one is at the moment, says one respondent. The intranet and the information systems overall are not satisfactory regarding their search functions. It's difficult to find relevant articles and information about patents, says another respondent.

> *Since it's difficult to find and publish information, people presume that they won't find things, which will make people stop from publishing information. Thus it's a spiral of negativity*.

Another individual acknowledges that the process of publishing information on the intranet is ineffective and time-consuming.

Even though the credibility on articles found on the web can be questioned, it is easier to search information with the better search engines that are represented there, thinks one individual. The information on the intranet and other information systems is not searchable and the respondent recognises the need for a common solution that searches information in all of AstraZeneca's information systems. Nowadays, there are too many information systems which make the uses of them less intuitive. Another respondent says that it's indistinct regarding which information systems that should be used and that education for how to use the systems is missing.

eRoom is an information system that is used as a project management tool. In the system the members of the project group can publish articles and use the discussion opportunities of eRoom to discuss certain topics. Even though there are opportunities to discuss topics through the use of eRoom, there doesn't seem to be anyone to carry these communities onwards thinks several of the persons we have interviewed. Few persons use the discussion function in the eRoom-system as it is not part of the working culture and is time-consuming, argues one respondent.

4.2.2 Opportunities

During the first interview phase the respondents addressed several opportunities for how the process of finding relevant information can be enhanced through the use of a wiki. Some is of a more general kind, whilst others are concrete suggestions on how to improve the information search process. We have categorised these into three distinct categories of opportunities: comprehensive opportunities, opportunities connected to current information systems, and specific opportunity areas for a wiki in the organisation.

Comprehensive Opportunities

Perhaps the most obvious but also at the same time the most comprehensive opportunity regarding a wiki's possibilities in the corporation is the vast expertise in the company.

> *To take care of the enormous multitude of knowledge and experience that is generated in every project, is not made today*.

The expertise represented by the employees in AstraZeneca represents a great opportunity whether it involves the use of a wiki or not. Several of the interviewed persons acknowledge that there is a positive attitude among the employees to share information with other employees, which is important for a wiki implementation which to a great extent is dependent on knowledge sharing.

Opportunities Connected to Current Information Systems

The biggest opportunity, addressed by several of the respondents, is to enhance the search function of the information systems currently in use. It's not easy to find what one searches for, says one respondent. To improve the process of finding reports and articles is a great opportunity in which the high-quality search function in the wiki can assist.

One respondent wants to create better availability to what has been done internally, e.g. regarding recent information about current project. Further, it is of interest to receive information regarding the different choices that has been made in the projects. Another respondent wants a clear connection between which individual has which information.

Specific Opportunity Areas for a Wiki in the Organisation

The respondents address several kinds of information needs that can be helped through the use of a wiki. The soft information that is in the mind of the employees is suitable for a wiki, says one respondent. This tacit knowledge is difficult to obtain and is nowadays only accessible if close colleagues have knowledge about an individual and the individual's knowledge area. A couple of the respondents thought of using wiki as a tool for knowledge transfer between different projects and sections of the organisation.

> *A more overall view regarding the projects and which products, solubles, and persons are involved*.

As the intranet has been criticised, much of the information on the intranet can be transferred to a wiki thinks a couple of individuals we have interviewed. This would make the publishing process faster and more accessible.

There is a valuable point in mapping the knowledge in the organisation says one of the respondents. To enhance the knowledge regarding which individual has which knowledge and to search individuals with certain competence can be advantageous in a wiki. This is partly made today through the intranet, where one can publish information regarding oneself. But this information is not easy accessible, and people are unaware that this function of the intranet exists says one respondent. To better connect information and knowledge with an individual would be valuable since the relevant information and persons can be difficult to find, says one respondent.

One respondent says the wiki can be used for specific interest groups or groups of knowledge, for example different kind of groups for different kinds of pharmaceutical technologies. Another respondent wants the wiki to handle benchmarking data; information regarding what other pharmaceutical companies are currently doing.

4.2.3 Influence on the Wiki Pilot's Structure and Content

Based on the information we gathered regarding the respondents thoughts on issues and opportunities with the information search process, current information systems and the information needs a wiki can support, we have made specific design-decisions regarding the wiki pilot's structure and content.

Connected to the knowledge area of Poorly Solubles, we designed the wiki to manage:

- General information about Poorly Solubles.
- Project information, with information about current and past projects.
- Information about external companies, and their systems.
- Information about useful links to external information. For example scientific articles, companies etc.
- Information regarding which individual has what knowledge, what the individual work with etc.
- Detailed information regarding solubles, substances etc.

Each of these information aspects was implemented in the wiki pilot, by making them relate directly to the starting page.

Figure 10. The wiki pilot's initial structure.

4.3 Wiki Application Overview

In this section we give an overview of the wiki application we used for the wiki pilot.

4.3.1 Atlassian Confluence

At AstraZeneca we used a wiki called Confluence, which is a commercial KM and collaboration tool from Atlassian Software Systems. Confluence is a flexible and scalable enterprise wiki with powerful tools for structuring and searching. Users can either go with a user-friendly WYSIWYG (What You See Is What You Get)-interface to create rich text whereas more advanced users can opt to create content using Confluence's wiki mark-up. The software also contains fine-grained security with space and page level permissions. Noteworthy is also that it contains a number of open source components.

Confluence is based on an open API for extension and integration and supports web services over interfaces such as SOAP and XML-RPC to, for example, enable applications or scripts to remotely update content, manage users, or administer individual spaces.

To access Confluence as a client a web-browser is needed. Officially supported browsers are Firefox or Internet Explorer 6+. On the other end, the server side, a CPU such as Dual 2.4GHz CPU Pentium Xeon or equivalent with 512MB+ RAM is recommended. Continuing, Confluence has full support for databases such as PostgreSQL 8+, MySQL 4.1, Oracle 10g+ and DB2 8.2+ to mention a few and can be installed in any server environment that supports J2EE 1.4.

4.3.2 The Dashboard

Confluence's structure is based on the idea that you may want to create more than one wiki, to make each wiki serve a different purpose. Most wiki software only consists of one wiki, making the front page of that wiki environment the start page. Since Confluence can contain more than one wiki, it has a need for a different front-page structure. In Confluence the start page is called the Dashboard from which you create different *spaces* which basically is a separate wiki. All the created wiki spaces are listed on the left side of the Dashboard; you can also mark your favourite spaces to decrease the list of spaces as the number grows. On the right side is a list of recently updated pages within all spaces, or within your favourite space(s) depending on settings. A list of favourite pages is also visible on the right side.

Each team, department and project has its own needs, and often requires its own workspace. That's why Confluence offers 'spaces' — multiple independently managed wikis, all part of the one site (Atlassian, 2007).

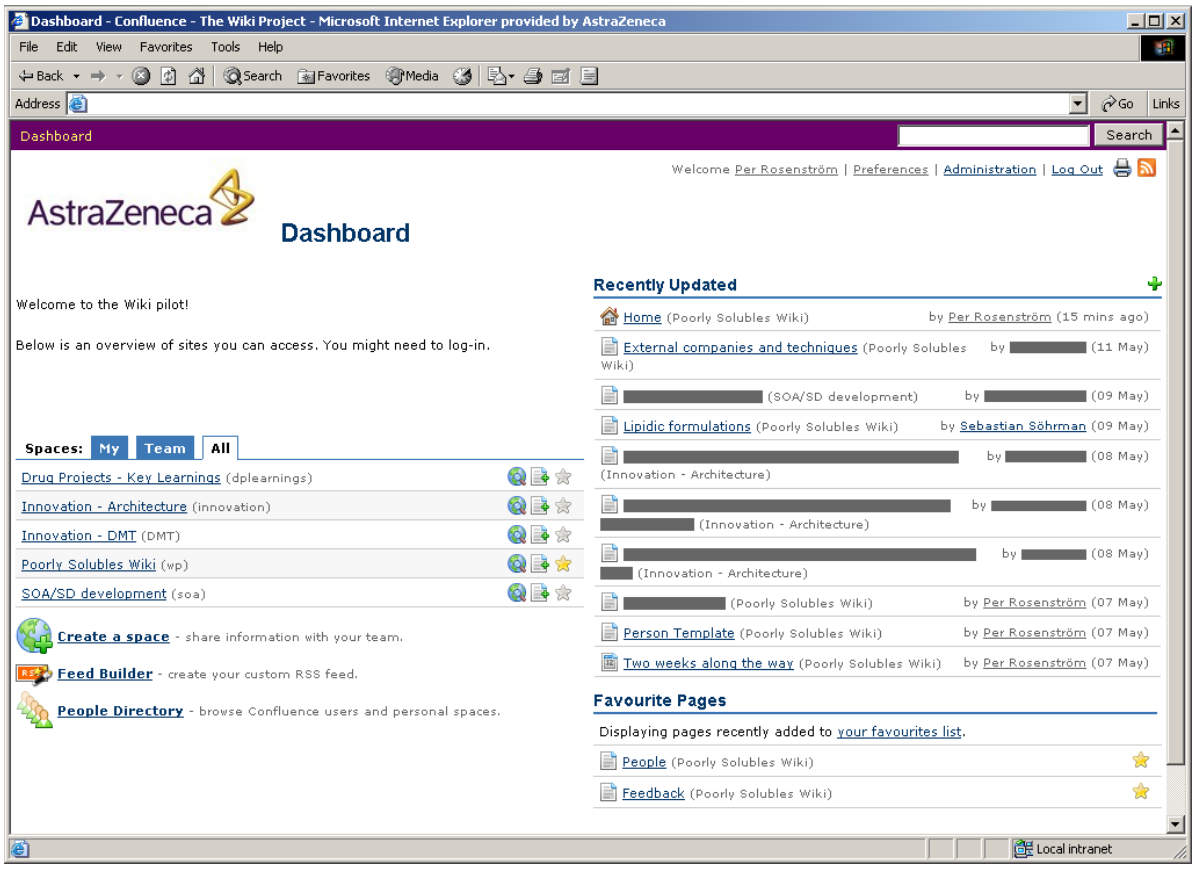

Figure 11. Confluence Dashboard (Some of the text is concealed due to privacy issues).

The software installed on AstraZeneca's intranet consists of five different spaces including our wiki pilot space called Poorly Solubles Wiki. The other four spaces were created by AstraZeneca employees interested in the wiki technology.

4.3.3 Poorly Solubles Wiki: Home

When you enter a wiki space you will end up on a page called *Home*. This is the root to all other pages within that space. Pages created within this space are called children, and those children pages can have sub-levels as well, making the structure a sort of family tree. The first page of the wiki is no different from the other pages within the wiki a part from the place within the structure. The basic functionalities found here are *Add Page*, *Add News* and *Edit*.

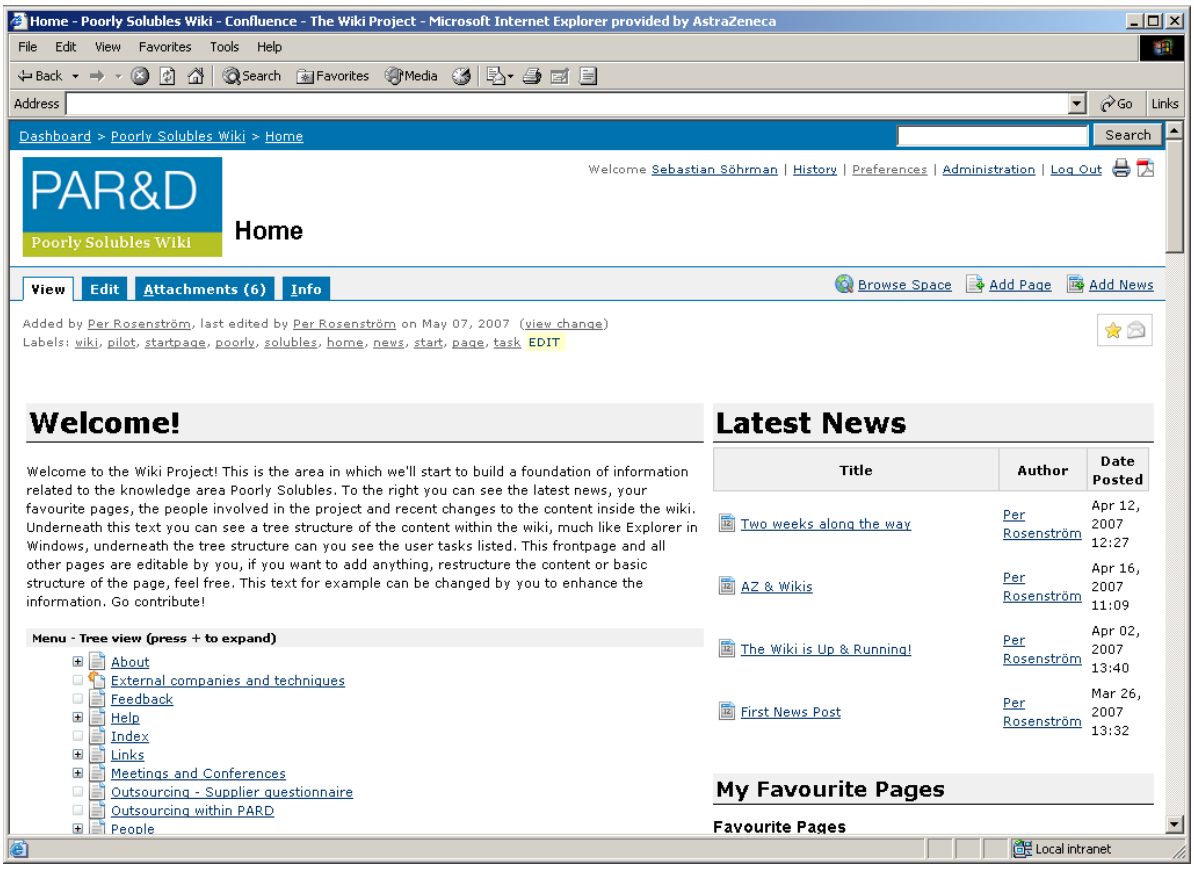

Figure 12. Confluence – Poorly Solubles Wiki: Home.

Figure 12 describes the Home of the Poorly Solubles Wiki space, created with the same colour scheme as the department in which the knowledge group Poorly Solubles is situated, PAR&D. We also created a custom logo from the PAR&D logo. We've also, together with the users, created all the content seen starting from the headings *Welcome* and *Latest News*. You can reach all other pages within the Poorly Solubles Wiki from this page using the tree view that expands pages as children in a family tree. You can also use the search engine situated on the top right corner.

4.3.4 Poorly Solubles Wiki: Edit Mode

As mentioned earlier, all pages within a wiki are editable, given you aren't restricted to use that functionality. When you enter the Edit mode in Confluence, you will be presented with three views; *Rich Text*, *Wiki Mark-up* and *Preview*. The default settings takes the user to the Rich Text view, which is a WYSIWYG-editor with basic text manipulation functionalities, much like text editors such as WordPad, although not comparable to editors such as Microsoft Word which has a lot more functions. The second view is the Wiki Mark-up view that is a syntax system that offers a simplified alternative to HTML. Our users more or less never used this alternative, as they were satisfied with the Rich Text editor. The last view is the Preview view, which is a page where you can see the changes you are about to do before saving and publishing those changes. Other options in the Edit mode are the functionality enabling the user to change the location of the page in the hierarchy and the option to remove the page which you are editing and even

change the name of the page. There is also the option to add a comment to the changes you are about to do, adding restrictions to the page and also add labels or keywords.

Figure 13. Confluence – Poorly Solubles Wiki: Edit Mode.

4.4 Results from the Second Interview Phase

In this section we introduce the results from the second interview phase. We present the users view regarding the wiki concept and the wiki pilot, and opinions connected to the key aspects in organisational culture and wiki perspectives, introduced in Theory: Focus.

4.4.1 Wiki Concept and Pilot evaluation

4.4.1.1 General Views

Regarding the users' general view of the wiki pilot after using it for about a month, most of them express a positive attitude towards it. Several of the participants points out how easy the wiki is to use. One user found it to be easier to use than the existing solution for projects, eRoom. The user also acknowledges that the wiki pilot is more easily used than the corporate intranet, InfoSpace. Overall the users seem positive towards the wiki pilot and see the opportunities to use the wiki as an easy way of enabling sharing of information and to communicate thoughts with each other. Several of the users hope that the wiki will be further used in the organisation in the future.

> *I would like to see a continuation with this tool actually, because… The way it is set up is going to encourage free, much easier communication across the company.*

The users are not aligned when it comes to the relationship between the wiki pilot, the eRoom solution, and the corporate intranet. One interviewed user claims that the wiki is something that is positioned in between the two existing solutions; taking these two solutions positive sides and combining them. One participant says the wiki is more different from the eRoom solution than he thought from the beginning, while another user thinks the wiki closely resembles the eRoom, which makes the wiki easy to recognise and use.

Another person we interviewed acknowledges the low technical threshold to get started, and thinks it is not the tool but the users that define the usage of the wiki.

> *I don't think it is the tool that sets the limits, but instead how one uses it that defines the limitations.*

For most of the users their opinion of the wiki pilot has remained positive since they were introduced to the pilot. Some of the users say that the wiki is a tool that gets better the more you use it. For one user, the view regarding the concept of wiki has by getting a concretisation in the wiki pilot become more distinct, and he now clearly sees the wiki as a way of enabling knowledge. One issue that has come more into focus after the wiki pilot started is how to manage and "clean up" the wiki. One of the interviewed users means that the wiki is built in a way which the user quickly can publish information and this can make the wiki become somewhat chaotic. This is an issue that has become more apparent since the users have used the wiki to a greater extent. Another user who expresses that it is difficult to know what to expect, since the wiki enables the user to publish material spontaneously, addresses this matter. This possibility is also a risk, he argues. It may become unstructured and difficult to find information.

Overall, for the major part of the users, the view regarding the wiki hasn't changed much since using the wiki; most users see the opportunities of the software. One user says the search possibilities were over his expectations, and that it is better than any system he has encountered in the organisation before.

It is important to note that some of the users have expressed some issues, especially when it comes to the easiness of using the wiki and the need for education in the wiki usage. One user says he think the system has a learning threshold.

> *The threshold of using the system was a little higher than I thought. I thought it could be used without any education, I don't think so anymore. You got to have education in the wiki usage.*

Further, the user says that there is another threshold, which is based on having a critical mass of information in the wiki.

> *I feel that there is a pretty high threshold based on building a critical mass of information for people to feel the wiki is valuable. To not only having to publish information, but get as much as one contributes in return.*

When asked about how the wiki should be positioned in relation to the organisations existing IT-tools, the shared answer among the users is that the wiki is something that should be seen as a complement to the intranet and the project tool eRoom. One user points out that the wiki cannot replace the intranet.

> *There is a need from the organisation to have really structured information that can be controlled.*

This opinion is shared by many of the interviewed users. They recognise the need from the organisational perspective to have the intranet; to have news and more structured information. But at the same time the users have addressed the issue of it being difficult to find what one searches for on the intranet. In relation to the intranet, the wikis search opportunities are better, this seem to be the common opinion. One user describes it in the following way:

> *The search opportunities in the wiki are unsurpassed; it is useless in our current solutions.*

When placed in relation to the eRoom, one user says he thinks the wiki in some way could replace the eRoom, but in a contradictory way he says that the eRoom is very practical for certain applications. The biggest opportunity is, as he sees it, for the wiki to be a complement to the intranet and the eRoom. Another user we have interviewed says that the wiki can't replace the eRoom, as there are good opportunities to regulate the access to an eRoom. The eRoom is good for creating work areas for groups, is one argument in favour of keeping the eRoom.

The view of the wiki as a complement to existing solutions is a common theme among the answers from the users. Some of the users would like to see the wiki as a tool that sort of resembles Wikipedia, in the meaning of using the wiki as a sort of knowledge database for everyone to use. Furthermore, to publish informal ad-hoc pieces of information, best practice or information about current interests. One user explains that such a tool doesn't exist in the organisation today, and that the wiki may take this unique position.

The perhaps biggest advantage with the wiki concept, compared to the other solutions in the organisation, addressed by the users is the wikis search possibilities. The searching possibilities

in other organisational IT-tools today are not satisfying. The fact that the wiki pilot not only searches labels but also searches in the content of documents is viewed as a great possibility. One user compares his experience with searching information in the wiki in relation to searching information on the web:

> *When I'm searching the web it can happen that I gets some unexpected hits; things that you didn't expect to find from the beginning, and that gives a kick. You discover more than you thought from the beginning, so it is real good.*

The users' also says that the effortlessness with which it is possible to publish information is an advantage over current informational solutions. The possibility to publish in a short amount of time was viewed as a big advantage.

One user says that, compared to the eRoom, the wiki allows the user to organise the content in a more logical way, which makes it easier to find the information one is searching for. The user claims that even for a user who hasn't previously used the wiki, its logical organisation of material is good for quickly finding relevant information. This view is shared by another user, who thinks the possibilities for individual users to create their own directories make the wiki more interactive. This view is somewhat contradicting by the opinions of another user. He says that the simplicity of publishing information can make the wiki somewhat messy and that there is a need for someone to organise the material to prevent this from happening.

Overall, the wiki's benefits over the current information solutions in the organisation are many according to the users. The user-friendliness in the software is one aspect, as the user interface makes it easy to navigate and is built in a way that promotes interactivity. One user says that the interactive possibilities in eRoom, such as chat and discussion are not used to a great extent, but that the possibilities for it to be used in a wiki are probably greater.

The wiki users were asked whether they thought that the information they received during the introduction meeting was good enough for them to start using the wiki or if there was something that they thought we had missed to say or show in the usage of the wiki. The overall response to that question was that there was no problem getting started using the wiki after the introduction meeting, and that the information received was enough to use the wiki. One user describes the wiki as being very straightforward and that the user interface is set up in a way which makes it easy to navigate and use. Several of the users said that the information received during the meeting, and that the PowerPoints and walkthrough-documents we had made for the users were useful. One user says that the introduction meeting was useful, but that the best way of learning a new system is by using it and testing it oneself.

Some minor issues were addressed by two of the users. One aspect that should have been brought to attention during the introduction meeting is that the user should save the changes he or she makes to a page before going to another page, or else the changes made to a page may disappear. The second minor issue was that it was not clear how to move a page in the wiki.

The users all agree that there is a need for an introduction meeting and that there is, at least initially, a need for support. There is a need for an introduction course that explains some of the basic functionality of the wiki. The overall view of the users is that the support may be lessened

after some time when the wiki has been up and running. One user says that the need for an introduction not only applies specifically to a wiki, but to information systems in general.

The view regarding how the support should be characterized differs among the users. One user thinks that the support can be limited to an expert user in each department. There is a need for support he argues, since new users need to be introduced.

Regarding the role we ourselves have taken in the wiki pilot as administrators, one user points out that without our support the wiki usage among the users wouldn't be near as effective as it would otherwise. There is a need of support in the initial stage, since there is a danger that if you don't support the wiki people will just abandon it, explains a user. If users encounter problems they won't continue using the wiki, if there is no support. The user says that the wiki is such a robust tool that it shouldn't need support in the longer term. But initially there is a need for support.

> *There is a need of someone who helps and explains that it's easy, and gives some push for one to do something in the wiki; if there is no pushing, the user won't do anything.*

Another user expresses the need of an introduction meeting, but also says there is a need in having a workshop with the group that shares the wiki so that as many as possible publishes information initially. In this workshop a wiki administrator should participate, so that one can discuss and make an internal evaluation about things like behaviour in the wiki etc.

It's important to make the users motivated to start using the wiki, explains another user. The work tasks published in the wiki were useful for the users to start focusing and using the wiki, explain the user. It's important to continuously motivate people, and that the users need to see the value of the wiki.

When the users encountered a problem in the wiki they used several different approaches when trying to solve the issue at hand. The most common approach when encountering a problem was to e-mail or phone us, the wiki administrators. An alternative approach was to use the Help-section in the wiki pilot. One user found the walkthrough document we put together to be a good resource. Another user made comments in the wiki, besides from e-mailing or phone us, since he knew we would read the information in the wiki.

Another alternative approach was addressed by two of the users. When they encountered a problem they used a trial-and-error approach, experimenting with different solutions to the particular problem at hand. Mostly the problem was solved by this approach. When the problem wasn't solved, the user closed down the wiki and did something else.

4.4.1.2 Wiki Usage

An absolute majority of all user expectations regarding the wiki were met or even exceeded. It's mainly the easy usage that our interviewees have expressed as being one of the most attractive aspects of the wiki usage, as expressed by one user:

> *I was surprised by how simple it was to use but even more surprised by the simplicity of the editing possibilities.*

It's important to notice that there are some contradicting views, as one user expressed the need for an initial education in the wiki usage. Further, one user reflected upon the soft hierarchical approach compared to what they're used to. The opposite view existed as well by a user who compared the wiki to eRoom.

When asked if there was something that the users experienced as difficult in the wiki usage, the overall impression among the users could be summarized by this user's point of view:

> *Everything was very straightforward. The editing tool was excellent, you could import links very easily, upload documents and all that.*

Although the users did not have any particularly big issues using the wiki, there existed some minor issues as well; with image format support, linking and moving pages. One user highlighted the excellent support for text editing compared to the poor support for images and tables:

> *Images and tables weren't handled as well as text.*

Another user expressed that a navigation menu was needed on the wiki pilot's Home page. As this was implemented, he thinks the usage became more useful.

Regarding the effort put into the wiki by the users, most users complained about the lack of time but felt that they've given the project enough time to understand what the wiki is about. Users were primarily driven by curiosity of the wiki concept when reflecting upon their level of involvement.

A couple of users pointed out that they clearly could see the possibilities of using wiki in their future projects:

> *I will absolutely use this tool, if it's available the next time I'll work in a project.*

> *This is really a great tool that I could use for my projects*

When talking about future project support, one user underscored the need for discipline to avoid anarchy:

> *When working in projects there is a need for guidance and discipline when contributing to limit the risk of anarchy.*

The dissatisfaction with existing solutions was also acknowledged by one user when the awareness of the wiki concept had risen:

> *I think it's much better than eRoom.*

The users expressed that there was some difficulties to find suitable content to share in the wiki because almost half of the group (four out of nine) lacked enough connection to Poorly Solubles to be able to add something which they knew would fit within the knowledge area, but most of

them managed to add some general content. One user thought the second work task stimulated to create related content. Another user pointed out that there is a lot of information that could be published in the wiki but the fact that it was just a pilot and no sharp version affected his level of contribution. A third user didn't even reflect upon adding something voluntarily and just completed the assigned tasks.

Another user described a perhaps unrelated scenario arguing for the importance of structural recognition, primarily in places that isn't continuously visited. Further, the user talks about the need for someone who is responsible in the wiki, someone who are responsible for the basic/founding structure in a space where other users have to go through that responsible user when changing central parts of the space. In this way usage will be pretty free but with a certain degree of administration. One user argued that it's impossible to expect what to find if no project leader is in place to publish content. But on the contrary, there will be other, more unpredictable material.

Consensus was found concerning the need for future education in wiki usage. They all felt that the introduction held by us students was enough to gain a basic understanding of how the wiki worked and how to use the basic functionality.

> *I believe that, just like I did, most users can get started and use this with the type of introduction that I got. I mean – it's enough.*

However, the opinions regarding the continuation of education within the wiki were quite differentiated. Everyone felt there was a need of help in some way to work more effective, faster and gain information about tools, functionality and so on which they might not come across on their own. One idea mentioned from several users was the idea of having a workshop for the users within a certain wiki space to discuss the wiki, share experiences etc., and having a power user attending. One user suggested a more advanced course after they've used the wiki for a while. Another suggestion was to educate expert users within different fields within the organisation and that these users would be the ones to turn to in case of need. These users should assemble like the workshop mentioned above and by that sharing experiences about what the users' need, what kind of questions that arises etc.

4.4.1.3 Work Tasks

The general opinion regarding the two work tasks we published in the wiki was positive. It can be difficult to get started with a new system and the users saw these tasks as a good way to get over the threshold of start using it. The first task was focused on just having a few things to do and using the edit functionality. One part of this task, collaborating to get a project and person template, wasn't done at all as the users found it difficult to understand the point of it. One user point out the need of making sure the tasks has a purpose and that the users see a benefit with them.

> *If you want people to do stuff, it has to be something you can really benefit from.*

This was noticeable in the second task where the users were supposed to add information regarding people with a connection to the knowledge area Poorly Solubles. One user point out

that this was something she wouldn't have thought of herself and another user pointed out that this was an area that the wiki would be very suitable for, and they could really benefit from, finding experts quickly.

> *I think in a way it will be a stimulus for the users to get using it.*

Even though some users didn't see a benefit in adding some of the information mentioned in the tasks (especially the first one), they all agreed on this being a good way to get started and necessary for the pilot to get activity.

> *This is something you can work with if you have a workshop or an introduction, putting together a set of tasks to get people started. I think it was great.*

The users had some interesting opinions when it comes to getting people to participate to a greater extent. User participation is the key to a successful wiki; our users had a few different ways of making this happen. The most mentioned one was to, in one way or another, force the users to use the wiki. The opinion was that people needs to be pushed to participate.

> *One way of doing this is of course that the coordinator or the project leader or whoever is responsible for this group asks people, if you work on adding everything important there so that's the place where you'll find everything, you don't mail any documents, they're put there and by because everyone needs to get things there they are forced to use it.*

A similar suggestion was to agree on using the wiki as a central tool within a project or such, for example to report certain documents. One user mentioned the chart displaying user statistics we had used within the wiki to keep track of user participation as a way of getting people to be more active, and also make use of these statistics as part of an employees yearly goals and as an easy way to show knowledge sharing for that certain individual.

For users to really prioritise time in their busy schedule to work with the wiki we found two main reasons. The first one was that the users really had to see an obvious benefit in using it. The second one was to have support from above; that the person responsible for a certain wiki and the user's manager needs to support the tool.

> *[...] and maybe in an organisation like this that the managers realize what it's about and are positive towards it. Because if they're on the right track, and believe it's good and that this is something we should use, then it's easier for people to put time into it.*

The overall opinion of the users is that there nothing that could be made differently in the course of the wiki pilot. The main issue, which could have been better, is the user participation. Different suggestions have been made by the users regarding this matter. One user says that a bigger group of users would have been helpful and that if the users would have used the wiki to a greater extent, so that the wiki would have more published information.

Another issue raised by several users is that it would have been helpful if the user group had contained people with a clearer connection to the knowledge area Poorly Solubles. Too many users had a weak connection to the area.

The organisation could have advertised the wiki to create a greater awareness, reason several users. Some sort of publicity about the wiki so that other people can get by it would be useful, says one user. Another user says that the organisation should have sent out public information about the project.

An issue addressed by a couple of the users is that there should have been a discussion within PAR&D about the wikis purpose, and its position in relation to other IT-solutions.

4.4.2 Organisational Culture

All users claim that they understand what's being communicated in the wiki. Some explained that the reason that they understood was their background as chemists and others said that they understood the content but was primarily using the wiki to learn the application. One user reflected upon the irrelativeness of some contributed content. Another user emphasized the value of being able to easily discuss information compared to using it as a general portal.

Most users trust the correctness of the content in the wiki even without the personal recognition of the contributor, or as one user expressed it:

> *I don't think the quality of information in a wiki would be worse than in a periodical.*

Overall the employees seem to regard each other's actions of being of good intentions, but accidents happen and content therefore has to be critically reviewed like any other source of information. One user also mentioned the positive sides of information diversity suggesting that the lowered publication gap and less dominant reviewing will stimulate to uploading of more content:

> *I think you get more information and also a broader range of information that would have been removed if it were to be reviewed before it was published.*

The effect of more content being contributed, is improved information availability and awareness, which also was also mentioned by another user.

One user compares the new situation in the wiki with the old way they work emphasizing the similarities:

> *It's no different from people having files in a shared area.*

The user continues to argue that faster contribution of content doesn't mean the information is less accurate, but then the user quickly switches angle and adds that the risk might be higher if what is being published is uncontrolled but concludes that he still doesn't see that being a big problem. Further the user sees the wiki as an ad-hoc way of publishing pieces of recent science and points out that he doesn't think the content will differ in the intranet compared to the wiki.

However, contrasting views did also exist. For example, a couple of the users say personal recognition is important to be able to determine the level of competence of the content provider.

Another user adds that the risk of incorrect information is a part of the wiki concept and thus can't be avoided. The same user further addresses that the purpose of the wiki affects the level of trust, exemplifying that using it for reporting will remove all trust issues. Having clear guidelines about reviewing is also important to balance the openness of the wiki concept as suggested by one user. Another risk when there's a lack of references, as one user claims, is that the wiki could potentially improve the distribution of rumours leading to decisions without any justifiable reasons, which the user says is happening quite often.

Another risk mentioned by the users is the risk of malicious information that's taken for granted by a huge amount of people might escalate into danger. To overcome the issue, the user underscores the need for references but also adds that the escalation problem probably won't be of great recognition within the company. The user suggests that the questions of greater importance should be: *what content could be placed on the wiki without risk of falling into wrong hands?* and *what's in it for me?* The issue of information correctness will be solved in time when the amount of the "right" users has reached a critical mass.

All users agree on the importance of correct information and at the same time almost every user expresses an awareness that incorrect content might exist and that it's important to be aware of it.

> *Of course it's important that the information is as correct as possible. However, it's even more important that people are aware that it's not always correct.*

But most users also expressed an acceptance for the risk as long as the level of correctness is close to perfect. Further, adding that anxiety might rise if too much suspicion existed concerning the validity of the content, which would render the tool useless. The balance act between the risk of invalid content and that too much reviewing of content could limit users will to contribute, was also mentioned by one user.

Further, the majority of users explicitly state that they feel a common trust in fellow employees thinking their actions are done in good intentions and that they are skilful enough to provide qualitative content.

One user suggested that it might be a good idea to clearly address when something is just speculations to avoid misunderstandings. The same user also brought forward another important aspect; the level of education, which affects how truths are being constructed. The user says that different persons have different degrees of critical views towards information.

One user explained that a system that lacks 100% correctness could not be used for regulatory purposes. The same user also primarily underscored the need for references to the contributor to be able to know where to find more information.

When asked if the contributor mattered, almost all interviewees agreed about the importance of whom the contributor is. This has to do with the personal recognition created by previous success, which is the main reason for trusting contributors, or as expressed by one user:

> *You are more likely to put your trust in persons you know, which previously has delivered high quality material.*

One user had a different perspective towards personal recognition, saying the aspect is important but says the personal recognition is not created by previous success. What matters is rather how a person uses reasoning to draw conclusions.

There was also emphasizes on the human side of the equation by one user who said that even if someone previously has gained others trust, mistakes can still occur:

> *Someone who previously has gained a lot of respect from earlier successful endeavours can also make mistakes, anyone can do that.*

There was also one user who primarily didn't think that focus should be on the contributor but rather on other things, as described in his vision:

> *I see the wiki as more of a… something to promote, spread around knowledge around networks of people, networks of projects we had, you know, things of current interests, interesting people. Maybe online debates about things, more ad-hoc kind of things that are interesting.*

Users have primarily three main areas of interest when it comes to publications of content in the wiki. It is issues concerning integrity and patents, and the understanding of the dynamic nature of the wiki concept where easy publication is an essential core feature.

A couple of users expressed a concern about the issue of integrity. One user suggested that it's important to keep the distance by only contributing facts which can't affect other user's integrity in any harmful way and that it's related to work as well. The user also suggested that instead of typing what other employees know, adding a reference to the knowledgeable person would be a preferable solution. It was also mentioned if something was contributed in the wiki which was closely related to someone else, then the related person should be notified:

> *If you write something about another person in the wiki, that person has to be notified about it to be able to correct it if needed.*

Almost half of the interviewed users expressed an anxiety/concern of the patent issue. One user reflected on how easy it is to contribute with content that might lead to legal consequences. Another user also agreed on the ease of contribution which highlights the need of always asking the question: *does this information fit in the forum of this audience?* The same conclusion was reached by another user who emphasizes the importance of an awareness regarding how contributed information could lead to issues when applying for patents. Following in the same direction, one user said that since the organisation is dependable on patents the wiki consequently has to be designed with that in mind. The same user further addresses the need for education before access to the wiki is granted.

Many users mentioned the need for quick publishing arguing that pre-publish reviewing would have an undesirable effect, or as stated by one user:

We'll miss the main point of using a wiki if we construct a process where contributions have to pass through a higher instance before publication.

Also related to the same issue, another user addressed the need of having an open discussion about how published content should be reviewed.

One user was excited by the possibility of being able to add all sorts of stuff in the wiki bringing forward a positive mindset compared to the traditional network-storage based way of working. The user further compares the old way of working using eRoom, forums and adds an imaginary powerful search feature. However, the user concludes that the wiki solution is still preferable. Another user believe the wiki is a great tool for letting people who perhaps hasn't published anything previously to be given the possibility to publish.

A more cautious attitude towards publishing was also surfaced during the interviews, for example one user expressed his will to contribute but concluded that he wouldn't add unconfirmed information.

Another user approaches the wiki concept by another perspective, by dismissing all functions related to discussions arguing that it's too time-consuming and instead suggests that the wiki should be used to structure work, and that there is a need for guidance about what to be published in the wiki, otherwise contributions are not likely to be made.

Other views expressed by individual users were a concern that too many low value contributions could lead to problems in finding desirable content. It also existed complains about the diversity of layouts used on different pages.

Almost all of the users distance themselves from the thought of keeping valuable information to themselves, and one user further added that he didn't believe this to be a big problem within the organisation. Another user expressed that this depend on the situation; sometimes is it better to wait until you've shaped your own opinion in contrast to situations where feedback might be more favourable. One user addressed the positive effects of the wiki concept regarding sharing information:

At the moment there is no obligation to share any information in the organisation. So this can only be a good thing, the wiki, because it gives the opportunity for people to think about sharing information.

When asked if a lack of time could hinder the contribution of content a majority of the users agreed. One user claimed the degree of contribution varied between different people and that the wiki was increasingly valuable for people who could benefit of the sharing of information.

Our users' opinions were diverse when asked if the risk of being criticized had hindered them from contributing. Most of them don't see how this could be problematic and one user said that reviewing could lead to improved quality. Other users compare the situation to already existing situations where expressed thoughts could be confronted claiming it's no different and therefore doesn't see it as a problem. This view was shared by one additional user, who concluded that in the wiki pilot, it's possible that the content might reach a greater amount of people. Further, one

user suggested that discussions could be held one on one and if consensus wasn't reached then the discussion would be made available for all users. The same user also expressed a concern about scenarios where discussions might escalate. One user explained his view of a potential future scenario when content has been changed by another user, thinking the change is probably correct and done in good intentions as most actions are conducted within the organisation, which also are executed without prestigious grounds.

One user brought forward the third person scenario stating the importance of notification if someone publishes content initially created by someone else:

> *Anybody's that's affected by your data, it's courtesy to ask them if they are happy to have it published on the wiki.*

Most users didn't acknowledge the insecurity that might arise from not knowing in which purposes the contributed content would be used in the future. Three users further expressed the similarities with any kind of information sharing and one user stressed that the question must always be held in mind.

Some risks with information sharing were also surfaced when two users underscored the importance of detailed and directed contributions to avoid misunderstandings:

> *It's important to pay attention to the way you create contributions to avoid future misunderstandings or to avoid that it later will be applied in an incorrect context.*

Another user reflected upon the need for restrictions to limit the sharing of information to known groups of users and thus also limit the possibilities of sensitive information leaking to competing organisations. Two users expressed different degrees of a contrasting opinion. One user said that he had been holding back on publishing certain information on the wiki, and another user mentioned that the question had been raised.

When asked about if there is a risk that contributions in the wiki could generate time-consuming questions towards the user who published the information, almost all of the users were united that there was no risk. Three users explicitly expressed their positive attitude towards sharing and one of them explained that the mere contribution of information implies a positive attitude towards additional questions that might be generated from other users. However, there were some contradicting opinions as well. One user concluded that if a contribution generated hundreds of questions, then it could be problematic. Another user acknowledged the problem of generally being of great proportion but hadn't reflected much upon it when working in the wiki.

Regarding the awareness of a clear view about how valuable contributions could be made in the wiki pilot, a majority of the users said they knew how to contribute with value to other users. Some of those users said that they could not explicitly contribute to the current wiki due their low involvement in the current knowledge area. One user expressed a strong belief for future wiki usage in the knowledge area of Poorly Solubles:

I think for Poorly Solubles, spreading our knowledge around the business is absolutely vital and having a tool like this is absolutely imperative actually. Doing it in a more traditional way isn't going to work as well.

Furthermore, one user expressed the need for a clear and common purpose for how the wiki should be used in work groups. The same user argued that the discussion of the wiki's purpose could preferable be held after some time, when the users are more familiar with the wiki concept. Opinions about the need for groups to have discussions aimed at creating a common understanding about what valuable contributions consisted of and where more valuable information was to be found, was also highlighted by one user. Another user expressed that contribution without later awareness of re-usage of the content could be perceived as contra-simulating.

When it comes to system usage, all users agree that motivation is an important factor when using a system for generating valuable results. One user claims the level of motivation affect the amount of contributions being made:

Lack of motivation will have a negative impact on the amount of contributions being made.

The same user further suggests that the wiki should be handled in a way that encourages spontaneity and thus a forced system usage should be avoided. The user further expresses the desirable attitude to be …*this information is valuable and I want to share it*. Another user suggests that motivation is rooted in how useful something is perceived to be. Hence by realizing the benefits of the system usage, motivation will come as well.

When asked about the most important factor when it comes to system usage, five of the users said that the main reason was that the system helped in performing the usual work. Three of them had a more individual focus when thinking about "usual work", while the other two said that they would use a system as long as it was useful for someone in the organisation. However, it's also important to be aware of the fact that different users mean different things when they think of "usual work" since they have different roles in the organisation. For example, when using the wiki as a report tool the usage would result in contributions of information, without information retrieval being a part of the wiki usage. On the other hand, when a wiki is used in a knowledge area the wiki usage may be to initially find useful information instead of contribution. This view is supported by the opinions of two users who strictly pointed out that they needed to find valuable content before they started to contribute in the wiki. One user also said that being able to find new information was enough to motive the user to further wiki usage, not mentioning whether that implied any contribution at all.

Another reason for system usage was expressed by one user who suggested that a system should be powerful enough to create valuable output by using limited inputs. Another user said the most valuable factor when using a system is that it is easy to work with. One user expressed the need for clear directions about which systems should be used.

Concerning the employees' awareness of current organisational support for knowledge sharing, most users expressed that they have perceived that the organisation supports the knowledge sharing between employees. One user said that it's visible by the fact that the organisation

provides the necessary infrastructure. In a contrasting view, one user expressed opinions on recent events where employees didn't think the IT-architecture for sharing knowledge was good enough. The user describes how they took the matter in their own hands by using home pages, and later forums, which were closed down to the users' disadvantage. The user also described the risk of declining motivation if there is no unified way of working, i.e. using both wiki and eRoom. Another user noticed the same issue from a different perspective and instead of only using one system the user promoted the need for someone in a group who should be responsible for contributions to the wiki to avoid system ignorance by the users.

Another user says the value of sharing have been increasingly transparent after an organisational reform. This viewpoint was contrasted by another user who claims that reforms often lead to internal competition, which in turns leads to knowledge hoarding. Furthermore, the user added that the latest reform failed to prevent formation of information silos, meaning that several users can work on the same problem, not knowing about each other. Further, another user acknowledges the existence of organisational values for sharing, but added that patent issues often hinder the flow of knowledge even though there is a will to share:

> *The spoken word is that we should share knowledge; however it's hard when you have to protect new knowledge to avoid patent issues.*

When asked about the importance of support from the organisation regarding knowledge sharing, all users are united that it's important. One user also added that it's impossible to predict the individual's need of information in such a complex organisation as AstraZeneca. The user is positive towards a solution that handles informal exchange of knowledge.

We asked the users if there was anyone above them in the organisational hierarchy who had expressed any opinions concerning the concept of wiki and this wiki project. In this matter most of the users had not experienced any kind of influence from other employees higher up in the organisational hierarchy. Three users said they've had experienced positive opinions from other employees above them in the organisational hierarchy. One user said that if the wiki was to be used in a more wide sense in the organisation, the support from individuals above in the organisational hierarchy was crucial. The user further said that the mentioned kind of support was not needed if the wiki should be used to support knowledge areas like Poorly Solubles, or projects. None of the users expressed opinions regarding that other individuals had influenced their view of the wiki concept.

4.4.3 Wiki Perspectives

4.4.3.1 Content

The users all have different opinions on how to make the informational content in a wiki relevant. The pattern that can be found is that several of the users think that before using the wiki it is necessary to discuss which information should be published in it. One of the users has some interesting opinions. He claims that it is important that already from the beginning think about the wikis structure. The user says that a good structure will in someway steer the way users publishes

information. Furthermore, he emphasises on the importance of already in the beginning have interesting information published in the wiki so that people can find it useful in their work:

> *There is a need to have a critical mass for the wiki to be worth to use; for the user to read information the wiki.*

The user explains that if people don't log in to the wiki to read the information then not many will contribute information either. He makes the conclusion that there is a great help to have a critical mass of information in the wiki from the start. In his further reasoning the user claims that once a critical mass of valuable information has been established in the wiki, the visitors will be there. The user also points out that this is a cultural issue, which is part of people's attitude, which makes them share information. He says that the contribution of valuable, relevant information will sort of run by itself once you have a critical mass of information. If this critical mass of information isn't there from the start, it may be difficult for the wiki to be filled with relevant information. On the issue regarding how the critical mass may be obtained he says:

> *Some sort of working group should handle this, to think about what information that should be published to make the wiki attractive and useful for others.*

For example, the user mentions that people in the organisation may develop a list of things that is useful to have in the wiki. Further, he points out that there may be useful to have a group of people which will be responsible for publishing information in the wiki in the initial phase and that they also advertise the wiki in the organisation. He says that if there are persons in the organisation that advertises and also help people in the wiki usage, it will be an advantage in making the wiki become more used.

One user thinks that it is necessary to have a clear objective of which area the wiki is about. If the objective is indistinct, there is a greater chance of irrelevant information being published in the wiki, the user argues. This viewpoint is shared by another user, which thinks it is important to frequently have discussions in the working group, regarding the purpose of the wiki – what information should be published, what information is missing etc. This view seems to be the most common among the users; that the work group together discusses the material in the wiki. Several of the users' points this out and the frequent communication among the users of the wiki seem to be the key.

> *You have to consult with experts and people who work in the area to make sure you covered all the important aspects.*

> *It stands on people themselves to make it live really.*

> *Information gets relevant when the people you talk to have the same interests as oneself.*

When asked which of the users that has defined the content in the wiki pilot, the general opinion was that all of the users have defined the content. It is the individual usage of several users which combined helps form the wikis content, seems to be the general opinion.

One of the users points out the structure of somewhat guiding what kind of information to have in the wiki. The structure, which we developed together with the users, forms a starting point the user says. The user says that he published material he found interesting to share with other users. Furthermore, the user says that it is desirable that as many users as possible is participating in the wiki, but that there will always be some individuals that participate more than others. This is based on that they have a greater interest in sharing knowledge. This is a view that is shared by another user we have interviewed. He says that the wiki may develop into an elitist type of tool if not a higher number of users participate in defining the content:

> *To make a really high impact you got to have that.*

The user says that if a smaller number of users gets the upper hand in the wiki, the other users will probably be quite scared to submit something because these experts, super users, is a sort of a quite dominant force on things. Hence it is positive if a fairly equal usage is possible. But the user claims that one can't control this since it's based on the individuals themselves.

Another wiki participant acknowledges this and says that all users should feel involved in the wiki, but that each individual can be involved at different levels. The user says that there is a need of having some persons that are more involved and feel a greater responsibility for the wiki. These should keep track of the structure. Similar thoughts are expressed by another user, which thinks that it depends on which purpose the wiki is used for. The user feels that not all users can define the content but instead a core group of people should be in charge of that.

> *There must be some kind of ownership or else it won't get started.*

In the initial phase of the wiki there is great effort to activate the wiki, which makes a natural ownership, the user says. Furthermore, the user thinks the scoop of the wiki may change over time, and that the owner group later on isn't much of owners no more, but instead the wiki will grow organic.

Most of the users believe there is a conflict between the information correctness and the dynamic nature of a wiki that is based on quick contributions of unstructured information. Although most of the users acknowledge that there may be a conflict, the users believe that the risk of information becoming incorrect is small and has to be compared to the benefits the wiki represent. One user says that the possible conflict is sort of incorporated into the wiki concept:

> *The great advantage is also the big downside; it is an issue that will be difficult to handle in an easy way. It is a price to pay to get the dynamic possibilities of the wiki.*

The user says that there is a balance of the two aspects, and that none of the aspects should be more important than the other. Further, the user says it is important to have a dynamic wiki that shouldn't become stale. He says that users should not only use the wiki for knowledge acquiring, but also use the intranet as a complement for getting correctness in information. One user wants to use a wiki as a project tool, in which a chosen structure and content has been applied. In this context, the user says, there is no conflict between the aspects. One interesting opinion he expresses is the following:

If you are really interested you anyway contact the person who has written the material. … you contact the person in the organisation so that you may get the whole context.

Another user we have interviewed doesn't think that there is an issue between the information correctness and that the user quickly can publish information since it is a matter of different kinds of information. When merely taking information from other scientific documents this is no problem. But there may be a problem when someone who doesn't really understand the scientific concept tries to write something about the scientific concept very quickly. The user acknowledges that he doesn't think this will happen as people in the organisation won't risk their integrity by making things up. The user further reasons that news items and events may be a little more dynamic and unstructured, while more scientific information should be more correct. This view is shared by another user who says that if one quickly publishes information without checking the facts, the information might be expressed in a way that leads to misinterpretations by others. One user points out that this is not a particular problem related to the wiki, but also connected to many IT-solutions and the Internet.

The users seem to think there is a balance between keeping the wiki dynamic and keeping it correct. One user expresses the following opinion in favour of the dynamic nature of a wiki:

I prefer the dynamic nature of the wiki, since it in a way is a self-correcting system. If I see something incorrect I can edit it so it becomes correct. This is what makes the wiki so useful in comparison to other databases. So if you are going to have a wiki you got to be aware that the information might be incorrect, and correct it yourself.

One user says that just because something takes a long time to publish, for example on the intranet, it doesn't make the information more correct. The user thinks there is an advantage if the publishing phase is accelerated. Another user says that it depends on the work group using the wiki to determine if the information correctness should be in focus. It may differ from for example an economic division that wants to keep the information as correct as possible, to a work group that prefer a more dynamic way of working.

A majority of the interviewed users agree that there is a need of a vision from above in the organisation regarding the purpose of the wiki. The vision is important for several reasons. One user opinion is that it is important that it's made clear that the wiki is implemented by a particular purpose, and that it is required to have a unified view regarding the balance of the dynamic and the formality in the wiki. If there is no vision then there is no unified view and this may result in using too many restrictions and unnecessary limitations in the wiki. The vision is also useful in motivating the users of the wiki, is an opinion expressed by a user. The wiki may not be used to its full potential and thus not fulfilling its purpose, if there is no clear vision.

One user thinks there is a need for some sort of advertising of the wiki to awaken the users' interest and participation. In this process the vision is a useful tool. The user says that just slipping the wiki in quietly in the organisation is probably not necessarily the right way to go and that some sort of publicity is needed. Some sort of statement regarding what the organisation is trying to achieve with the wiki, and for this the vision can be useful.

In a more specific sense, the users have different opinions regarding how the vision should be characterised. One user wants the vision to be a document of around two pages, which explains the advantages of the wiki compared to other solutions. Overall, the user says there is a need for a policy document in which it clearly says when one system should be used and not be used. This is currently an issue since different work groups and individuals use different systems in the organisation. One user thinks that the vision should only be formed in a work group and that the vision regarding the positioning of the wiki gets applied in a department. Based on the vision in the own department, the different work groups can set up their own restrictions regarding for example how correctness should be handled, which information should be published etc.

4.4.3.2 Structure

When we went public with the wiki pilot we had created a ground structure based on the answers received in the first interview phase, but we also added some basic pages such as *Help, Playground* and *Feedback*. The users pointed out that it's important for the structure to easily make all content accessible and one user pointed out that the structure we created was good and it was easy to gain a comprehensive understanding of the content within the wiki.

> *I think that most people are quite familiar to a directory structure, trees and so on. I think it's a good architecture for an initial rollout but you might want to redesign it later.*

We gained a lot of feedback regarding the structure of the wiki and overall the opinions were quite alike. When you begin working with the wiki, it's completely empty and has no structure at all. Most users mention the need of some kind of ground structure, and only one user supported the thought of having an empty wiki to start from. This user thought is was a big problem to first build a structure that is logic and everyone understands, and then add information; his opinion was that it should be the other way around. One user said he didn't think the users themselves could handle that.

> *I think it's good if there is a structure, or that you define it – some kind of ground structure.*

The users agreed to some extent regarding who should define this ground structure. This is the responsibility of the person, or persons, in charge of a certain wiki space – for example a project manager, line manager etc. On the other hand, one user pointed out that he felt the organisation should have some kind of ground structure:

> *I think it's good if the organisation has some kind of ground structure because otherwise it can be very negative. I have negative experience from when users define the structure themselves.*

This view is contradicted by the opinions of another user, which points out an issue with that approach:

> *I think it's hard for the organisation to know what the best structure is […] if the organisation isn't very skilled in consulting the right users and get advices concerning that matter*.

Other problems with this approach were mentioned – if the organisation tries to get something that suite as many as possible, this could make it too generic. One of the users thought there is a need for a predefined structure, which would be unique for the group working with the wiki, for example PAR&D. Two other users continue:

> *I think it is a fine line because you don't want to discourage uncontrolled use in a way, because that is the beauty of the wiki. People can just put up information quickly. I think it may become much more like everything else, won't it? The company… so I think having a user-driven thing has got the benefits of something a bit more unique.*

> *I think it should be flexible enough to, I mean, I don't want us to end up in InfoSpace, and that every page looks the same, where you've created an overall menu structure for the whole company.*

The users points out different arguments supporting each side. They don't want the organisation to define the ground structure altogether, and they feel that the structure can't be handled by the users on their own. A similarity between the ground structures would be good to lower the threshold for each new space, says one user. Like mentioned earlier, several users see a ground structure based on someone in charge of the space at hand. One user thinks it's suitable that a project leader puts up a decent tree structure to find meeting protocols and other important project documents, defining a suitable ground structure for a particular group.

One user thinks the person in charge of a space would probably like to define and be in charge of the structure, but also thinks it would be more dynamic if the users can work with it while it grows.

> *I think it would be ideally if there was a predefined structure where the users can add branches to the tree if there is anything they're missing.*

> *I believe that in the long run it is the people who can build the best structure are the users themselves.*

As we mentioned earlier, one user has had some negative experiences with users defining the structure themselves.

> *The users can probably manage it provided there is some kind of code of practice kind of thing, to some extent. Again, it comes down to some sort of low-level management.*

Another user says he wants a structure where the users can be creative, but he still doesn't think it should be let entirely free for anyone to change without governance. He wants limited governance, but still governance.

> *I don't think the users can handle it on their own. […] When you start up you need some kind of… I have a hard time believing you can start without a ground structure. It might be changed later on and the users change the structure to something they feel is correct, or to what's needed by creating new pages and so on. But I have a hard time believing you can leave it totally free.*

The majority of the users realized there was some kind of problem involved in the growth of the wiki. Several users mentioned that the need for a good search engine would increase as the tree structure got larger; as it will eventually be a key to find the information one needs.

> *The search engine needs to make it easy for me find where I want to go, to reach the knowledge I'm after.*

Regarding the structure, one user said the following:

> *It will be affected in the way that you probably won't look in the tree anymore – you search.*

Even if a lot of the users found the search engine to be the key to find information as the wiki grows, several users mentioned the need for administration over the basic structure. One user said that as the wiki content evolves the structure might not evolve in the same direction. Other users point out:

> *You'll probably need someone to watch over this structure, making sure it evolves in the right direction.*

> *I guess as it gets bigger it gets harder to navigate around, potentially. So that's were some kind of management is needed, possibly.*

Although most of the users who were concerned with this problem thought it was a need to have some people assigned to the task of making sure the structure reflects the content, one user had a slightly different approach.

> *I imagine that in some way the structure… if there are large differences between the ground structure and the optimal structure in the users' point of view, then I think that the structure will change towards the ideal way some how. I believe it will happen, to be honest, but it will probably take quite some time.*

4.4.3.3 Functions

Regarding the graphical user interface of the wiki, the overall response from the users was positive. Most users found it to be easy to use and understand. Although a major part of the users were positive towards the user interface, some individuals had some minor issues with it. One of these issues appeared when using the editing mode in the wiki. The editing mode is taking place in a specific window inside of the main window. This made page scrolling a little problematic. Another user says that he would have wanted the functions of the wiki Mark-up language, which enables a little more advanced functionality, in a more visual approach. Another issue appeared when creating a page; the user must decide under which parent page the edited page should be placed. One user wanted the wiki to automatically place the created page under a relevant parent page. Another user had the opinions that the homepage of the wiki space was too messy, and that he would prefer a more simplified version, which is easier to manage. Overall, the response towards the user interface in the wiki was positive with the exception of some minor issues.

For the most part, the users found the user interface and the functions to be logical. Most users had no problem with the user interface and the functions, but it may be due to the fact that most of them already had computer experience. Even if the wiki is made to be easily used – if the user have limited or none user experience – there may be some difficulties, even though this is not viewed as being a great problem by the users.

One user who thought the user interface and the functions were logical said that he thought it would be good if the different wiki spaces was made to look different, by help from expert users.

> *It would be good if the wiki spaces looks different, has different colours, logos.*

This would probably make each space have a unique identity and making it less difficult to separate one space from another.

One user says the usage was fairly obvious but had some minor issues with the subfolders, which he stumbled on by chance when he didn't have the tree-hierarchy expanded fully. This was a minor issue and it took some time until the user found out the location of the specific articles. In that case it would probably be good to use a mind-map to get a quick overview of the wiki, the user explained. Apart from this, the user found the wiki to be very straightforward; it was easy to edit, import links and upload documents.

In particular, there was one user who encountered a number of minor issues. The user would like functionality in the wiki which highlights how a page relates to another page. If this could be made automatically in the wiki, so that the users won't have to find the relations themselves, it would have been good says the user. Another issue is that the attachments must be placed on the page you want to have the attachment on. The user says that the attachments could instead be placed in some central repository. Another issue is that when clicking on a link, it does not open in a new window but in the existing window.

But overall, the users' opinion is that the interface and functions are logical.

> *Much of the things in the wiki are recognised from other systems.*

All the users say that the graphical user interface is of a great importance when using a system. As two of the users expresses it:

> *It has a tremendous importance. Often it has a crucial importance.*
>
> *For many of the applications we work with today for our research and similar tasks, the user interface is of crucial importance.*

If the interface is attractive it makes it fun to use, explains a user. As one of the users explains: *if the user interface isn't functional and useful, I hesitate before working in the system*. One user says that a non-functional user interface bothers him to a greater extent regarding if it is a system he uses more occasionally. It is of great importance to have an easily understandable user interface, the user explains, and that understanding a user interface often becomes extra difficult

when changing from one system to another. One user emphasises the importance that the user interface shouldn't contain too much information, since it may prevent the user from getting a clear view of the user interface.

Regarding the editing mode and the wiki pilot's WYSIWYG-approach, the users were very positive. The users found the editing to be very easy and the software to be very robust. Some of the thoughts expressed about the WYSIWYG-editing by the users were:

> *Easy to use and edit.*
>
> *It did everything I wanted it to do.*

Aside from the major positive opinions, there were some minor issues. For example, one user wanted the editing mode to be sustained while moving from one page to another. This could have been made easier, he says. One user missed an undo function in the wiki. When he tried editing in the wiki and wanted to undo, there was no undo function. The user also had some trouble with using labels. Another user found the editing to be a little more difficult than he thought from the start. He reasons that with a little education and practice there is no real issue. One thing that is requested is an expanded search function. The users are positive towards the wikis search opportunities, but would like the wiki to search in the different systems and databases used in the organisation.

Overall, the users' opinion is that the user interface in the wiki pilot was satisfying and that the WYSIWYG-editing was appreciated, especially if the wiki has users with little or none computer experience.

> *It's really positive since it is so easy to use and looks like already existing systems. It shows that the system is based on the users and not on the contrary.*

The users' general viewpoint regarding how to navigate in the wiki was that it was easy to understand how to find one's way through the user interface. During the course of the wiki pilot we added an additional tree hierarchy on the start page. One user says that the navigation became clearer as this menu was added. There was only in some occasions where the navigation wasn't as clear as it could have been.

> *Often there was a list with different categories at the top of the page, describing the pages that were over the current page in the hierarchy. I found that I sometimes missed a complete hierarchy.*

Another user says he found the hierarchical list to be useful. It is a good way to navigate, he says, since one easily can get back to the wiki's dashboard or the Poorly Solubles wiki space by clicking on it. One user says that the wiki contained too much text on some pages, which had a negative impact on the navigation possibilities. He means that this is no big issue, but it sort of interrupts the navigation.

The users also expressed some general thoughts about navigation in information systems, which don't only apply to a wiki solution.

When navigating, you somehow get used to the logic and the structure, which is not a hundred percent obvious. This depends on the way one creates the structure, which words that are used and how to categorise things. Different people have different ways of thinking. I think you have to determine a certain structure and then you have to try and learn that structure.

The users pinpoint the need of having an intuitive navigation. It shouldn't take much time to learn to get from one place to another.

All the users are united that anonymity is something that shouldn't take place in a wiki, for several reasons. We didn't use anonymity in the wiki pilot but one user says that he don't think that the wiki pilot would have been affected to a great extent if anonymity was used. This since the wiki user group was relatively small. If the user group would have been bigger he thinks that the use of anonymity would have had an impact on the usage.

The users don't see anonymity as a good thing. For example, when publishing scientific information it is good to have the name of the person who published the article, this if you want to discuss or ask something with the person.

There is a value in knowing who published the information. There is an aspect of personal recognition.

One of the points is to find the person who published the information and hopefully get even more information.

This recognition factor is acknowledged by many of the users. The wiki's openness is a possibility to create new friends, says one of the users. Another user says that he would use the wiki even if it uses anonymity. It has no big impact on his usage, his says. Although, he thinks there is an issue of loosing the connection between a person and the information, to know if a person has knowledge in a particular area. If anonymity is allowed in a wiki, there is a higher chance of the wiki being misused says one user.

The risk of having material not suitable on the wiki is higher.

One user says that the use of anonymity in a wiki is in contradiction to the whole wiki concept; that the purpose of the wiki is missed:

I think it should be allowed to see who contributed information, because it's in the sprit of openness of the whole thing.

One user explains that anonymity isn't used in the corporation and that using anonymity should be prohibited. He further reasons that the wiki may have a hard time being accepted if anonymity is used and that information can't be trusted.

When asked if there are some situations where the wiki could be in need of restrictions, the common view among the users is that there are situations where restrictions should be used but

that one should carefully consider using restrictions since it may prevent the purpose of a wiki as a tool of enabling everyone to share and publish information. If restrictions are used this viewpoint is sort of contradicted.

Most of the users acknowledge that there is a need of using restrictions in the wiki when handling certain knowledge which must be protected; information which shouldn't be seen by other organisations or even by individuals in the own organisation, this to prevent certain information from spreading. One user says that therein lays the difficult issue regarding the wiki; at the same time as the wiki should be as open as possible there is a need to restrict certain, classified information. It is an important balance. Another user agrees with this and says that his immediate thought is that you shouldn't have to use restrictions in a wiki, since the wiki should be a truly open tool. But then again, there might be some information that needs to be protected.

Some of the users' reason that it to some extent depends on what the wiki is used for. One user says that there are things which require restrictions, and then you shouldn't have that information at all in the wiki. There are other tools which handle restrictions in a more suitable way, he argues. This view is shared by another user who says that if it is important information, then that information shouldn't be in the wiki at all. That kind of information should be published and discussed elsewhere. One user thinks the risks are to be weighed against the benefits, and he says the benefits are greater. The wiki really isn't a tool for handling confidential information, he reasons, but it goes back to the purpose and the vision of the wiki.

5. Discussion

In this chapter we will discuss the results from the interviews and the wiki pilot as we try to verify the key aspects found in Theory: Focus. As this study's purpose is to investigate which the key aspects are when introducing a wiki in a knowledge organisation, we now will discuss this in relation to the results.

5.1 Wiki Pilot Analysis

5.1.1 General Views

In interview phase one, before using the wiki pilot, the users expressed a positive attitude towards sharing information and using information systems. After using the wiki pilot, a major part of the users were still positive towards it and sees it as a way of communicating and sharing information across the organisation. This positive attitude is important when implementing a wiki; hence if the user isn't positive towards knowledge sharing or using IT-tools, the wiki probably won't be used to a greater extent. Most users see the wiki as a sort of complement to existing solutions, rather than replacing them.

Issues addressed by the users after using the wiki pilot is how to manage the wiki, e.g. if the wiki becomes somewhat overloaded with information, and that there are thresholds when it comes to learning the wiki, and that there is a need to have a critical mass of information in the wiki from the start. Further, the users expressed the need of having an administrator of some sort who can manage the wiki, to prevent it from becoming unstructured. Especially the issue of having a critical mass of information in the wiki already from the beginning is very important. We think that this is a significant issue; having a critical mass of information already from the beginning will most probably increase the usage, as the users will find valuable information on the wiki from the start. Perhaps there also would have been a greater activity and more information published in the wiki pilot if the users had a more close connection to the knowledge area of Poorly Solubles. If the users feel that they can find valuable information in the wiki, which relates to their everyday work, there is a higher probability that the wiki is used. The users weren't perhaps prepared that the initial phase of a wiki is based on contributions of information, and this may have prevented a greater extent of wiki usage. Hence it is important to shorten the start-up phase based on getting a critical mass of valuable information in the wiki, for the users to see the value in the wiki.

The users see the wiki take the position in the organisation as a complement to existing IT-tools. It is recognised that the organisation has a need of having controlled, structured information on the intranet. Further, some users see the wiki take place in the organisation as a knowledge database, resembling Wikipedia, or as a tool for ad-hoc pieces of information. We think that the wiki can't replace the intranet, since there is a need in the organisation to have more structured, controlled information. The wiki could possibly replace the eRoom, as a tool for managing projects, but it is recognised that eRoom has great possibilities to regulate the access to information. Security is something that is important in a knowledge organisation, and this may prevent the adapting process of more open IT-solutions. There is a will of sharing information among the users, but at the same time there are some concerns that the information may be used

in wrong ways. This is something that has been the major issue in previous information solutions explains one user. When it comes to the wiki, we think that the organisation must be clear about the purpose of the wiki and how to position it in relation to existing solutions. The organisation must also discuss if they think that the benefits of sharing information in the wiki is greater than the possible drawbacks of information being misused.

The main advantage in the wiki addressed by the users is its overall sharing opportunities, its easy publishing and its searching possibilities. One user described the wiki pilot as being built in a way that promotes interactivity, through discussion possibilities. This interactivity, the community aspect, is one of the advantages with the wiki, and hence it is positive that this aspect is recognised by the users. In the IT-solutions currently used in the organisation there are some attempts to reach a community usage, for example has the eRoom-solution some discussion possibilities but these are almost never used according to the users. The majority of collaboration taking place in the organisation today is localised to projects or to nearby co-workers. Since an employee often works together with these persons in a project there is no need to use the discussion possibilities in the eRoom, since it is easier to simply go to the co-workers room or use the phone. The wiki may be used to support groups that normally don't work together if there is a need to communicate regarding certain knowledge. The ease-of-use represented in the wiki enables the user to really do what he/she wants in the system. Compared to the slow publishing phase of the intranet, the wiki enables users to publish information quickly. At the same time, if the users aren't in some way supported by an administrator, there is a probability that the content in the wiki may become unstructured and messy. This addresses the issue of having a wiki administrator of some sort.

The users recognised the usefulness in having an introduction meeting and walkthrough-documents when introducing the wiki concept. This is something we recommend when introducing a wiki to the users in an organisation. Some of the users pointed out some minor issues in the walkthrough of the wiki during the introduction meeting, and hence we advice to have a walkthrough of the wiki where the overall concept and functionality are introduced. Even though, as one user puts it, the best way of learning a new system is to actually use it and test it oneself.

According to the users, as there is a need for an introduction meeting when introducing the wiki concept, there is also a need for support, at least initially. The need for introduction and support does not only apply only to the wiki, but to systems in general to become more accepted and useful for the user. The users say that the support may be backed off after some time, as the users gets used to the wiki. The users also say it's important to continuously motivate the users and to arrange workshops, so a discussion of the purpose of the wiki can take place. We agree that the need for motivation is very important, and in this the need for expert users may arise. These expert users can introduce the wiki concept during an introduction meeting and initially provide support, but as the need for support is reduced the expert users' role can become more of a motivator. It is important that the users are motivated in using the wiki, especially in the initial phase where it is important to contribute a valuable content. In the initial phase the expert user may serve an important role. The expert user should motivate the user in publishing information and using the wiki even though the benefits may be difficult to grasp.

When using the wiki the users sometimes encountered problems and we think that since the users knew that there were people dedicated at providing support, the threshold to look for help such as sending an e-mail, was probably low. If there wouldn't have been any active support the users may have looked for their own solutions or, if they don't have any solution to the problem at hand, simply drop the problem and leave the wiki. We think that since the users have different approaches when encountering a problem, there should be different kinds of assistance. In the help-section of the wiki pilot we published PowerPoint-walkthroughs that explained step-by-step how to use some of the basic functionality of the wiki. To enable different kinds of support makes the possibilities for the user to solve the problem at hand more probable.

5.1.2 Wiki Usage

We wanted to know how the users have experienced the pilot. The users' attitude has been overwhelmingly positive as we found out both during our times of direct confrontation via interviews or by other indirect contacts like phone or e-mail. Users were excited about the, for them, new wiki concept and their expectations were not let down. Nor were they when they tried the system and were amazed by the easy usage. Another reason that perhaps explains their positive attitude towards the wiki we believe was that there was no comparable system in place. The users were used to perform their work at shared network drivers or the project tool eRoom.

A positive attitude alone is not enough to gain momentum to start the evolution into a truly valuable system. The typical wiki usage in the pilot was to contribute with content, which is pretty natural since the wiki started from scratch. However, to see the true potential of the solution in KM terms, value is gained for the first time when someone reuses something in the system. It could be reuse of content or just a reflection upon content that stimulates decision-making in a new direction. There may have been many reasons to why the wiki didn't grow into the just mentioned type of scenario. One reason was that the pilot was just a pilot and not a sharp version. Another reason was that there wasn't much overlapping in information needs among the different roles that formed our group of users. Even though some contributed with area specific knowledge and others who wasn't closely connected to the area submitted content of a more general character. But we believe that one of the main causes of the low activity in the wiki was a lack of time both by the user group and the total time the pilot was available.

5.1.3 Work Tasks

During the pilot we decided to conduct a couple of tasks for the users. The reasons to why we conducted these tasks were to get the users to have something concrete to work with once they entered the wiki. Since the time frame we had was quite limited we also wanted to show the users some possible benefits of collaboration, which they probably wouldn't experience without our help. The first task included adding and editing material; we had some hope that one part of this task would show them some collaboration possibilities but that failed. The users felt it was hard to understand the purpose and didn't really know what to do, the consequence was that one user tried to edit but failed using the software. The second task was about adding pages with information about people, the names was then listed on another page that built a knowledge base of people within Poorly Solubles. The users worked much harder on this task, although we noticed the people with less connection to Poorly Solubles couldn't really add valuable information.

Our opinion is that tasks are very useful for users to get the started within the wiki, especially when you want something in particular to build up fast. It's not only important for the people in charge of a certain wiki to get content as a result of the task, but also something the users see as a help to move over the threshold of a new technology and also getting to know a new wiki space. It can also lead users to use some functionality which they wouldn't have used or come across without the tasks. It seems very important for the success of a certain task that the users understand the purpose, since time is of the essence and people are not likely to put effort into something they don't see the value of. Therefore we believe it would be useful for the person(s) in charge of a certain wiki space to put together a set of tasks which aims at adding valuable information to the users as well as to the overall content of the wiki to speed up the process of reaching a critical mass of content. If possible, the overall wiki success would gain from the tasks being of such variety that users get introduced to several important features within the wiki environment.

Before we gave the users access to the wiki we held a short introduction to the wiki concept, educating the users in the basic functionalities and underlying thoughts of wikis. Even though one of the thoughts behind the wiki concept is to try to ease the threshold for the use of it, we couldn't expect the users to work without any introduction. We feel that even though there are a lot of similarities between the interface in the wiki and other software interfaces, a basic introduction is needed, especially to the underlying collaborative thoughts upon which the wiki concept is built.

Like we mentioned earlier, the users felt the introduction was enough to get started, but they presented several different ways of continuing the education within the wiki environment. Since the users presented several different ways of getting better at working in the environment, there is probably a need for more than one way of achieving this, depending on the user. Some users seem to help themselves by reading help pages, looking online at different resources where help can be found and also using trail and error. Others want personal support by mail, phone or more advanced educational packages.

We also realized that different persons will have different roles within the wiki, some will read the content while others will contribute material, some will edit the material and some will be in charge of a whole space, working with structure and more advanced features. This will result in different levels of educational need.

We see five different ways of helping the users to work well in the wiki:

- *Courses*
  A basic introductory course for a basic understanding of the wiki's functionalities and about the underlying concept.

- *Expert users*
  Create a network of well-educated wiki users within the organisation. These users can be helpful to the users within the department he/she works in. Those networks can be particularly important for the wiki repository, as they should be well aware of the users' problems. Depending on the amount of problems arising this might reduce the need of a helpdesk.

- *Helpdesk*
  Create some sort of helpdesk with well-educated personnel, e-mail and/or phone support.

- *Tasks*
  Create introductory tasks to get the wiki started and also for users to try out some basic features. Create tasks for different types of users depending on their roles within the wiki. These tasks should serve an obvious purpose and give a good understanding on how to work well in a particular role.

- *Wiki repository*
  Create some kind of repository for tutorials, frequently asked questions, tips etc. This could be in the form of a wiki space. Frequently update and add information.

When the users have been introduced to the wiki, it's important to keep them there; the wiki needs participants to work well. We mentioned earlier that one very important factor to participation is that the users see an obvious benefit from using it. The users themselves also mentioned the need for support from the organisation; their managers need to understand and encourage the value of working within the wiki and giving the users time in their busy schedule to participate. Another thing, which was widely mentioned, was to in some way force the users to participate; by force we mean making the information in the wiki crucial to their work to some extent. To work well, they need to participate. We believe this is something important, for example – if the wiki is decided to support a project, put the most important information about that project in the wiki, the project leader shouldn't e-mail too much information, instead use the wiki as the main tool for communication. A similar approach is to agree on working with the wiki for certain tasks within a project or such, like one user said – agree on making the wiki the tool in which certain documents are shared and reported.

Another way of promoting wiki participation is to focus on user participation statistics. By using this kind of statistics it's possible to identify roles within the user group by looking at what the users do in the wiki. Some users will have a large amount of created pages; some will have a lot of edits and some are just viewing pages. By identifying roles, you can give these users' education or advice in which functionalities and conceptual thoughts they would gain in knowing to conduct their work within the wiki environment. These roles will also give a chance to identify areas in which users fail to participate, for example – some users might not add labels to content within the wiki, the person in charge of the wiki space in which these users fail to add labels can address this issue by talking to that person and make them understand the importance of this feature and ask them to use that functionality in the future. If the statistics are visible to all users they might feel encouraged to participate more, and also see what other users are doing and in which areas they're not active in. Managers can also use these statistics to evaluate subordinates performance. Although these statistics can serve several different purposes, it's important to understand the issues with this approach, like most statistics there are factors that need to be taken into account when analysing them. If these statistics are taken too seriously users might exploit this feature by making unnecessary edits on labels etc., just to receive better-looking statistics. It might also create an environment where users spend unnecessary time within the wiki, making other important tasks suffer.

Overall the users are satisfied with our support in the wiki pilot. The issue lies in how to boost the wiki usage. According to the users, this could have been made in several ways. For example by expanding the user group, assigning more work tasks in the wiki. The users think the organisation could have advertised the wiki to create awareness around the wiki pilot in the organisation. All these aspects are good proposals, but most important we think is to have a bigger user group and that the users have a strong connection to the knowledge published in the wiki.

5.2 Organisational Culture

In this section we connect the results from the second interview phase with the theory regarding key aspects of organisational culture, which can be found in Theory: Focus.

Judging from our empiric material, correct content lies in the core of the organisation. It is therefore particularly interesting that we know the users have faith in a tool such as wiki where one of the founding principles is that content can be quickly published without any reviewing. But the users are generally aware of some of the shortcoming and risks that involves the wiki concept. There were primarily two risks involved; one reason was to prevent the anxiety that may arise when too much suspicion exists concerning the validity of the available content, something that in turn would render the tool useless. And second, the risk of misunderstandings in the sense that content could be applied in an incorrect context. To counter the disadvantages of rapid publishing of content, users emphasise the need for individuals to critically review the content, just like any other source of information.

5.2.1 Knowledge Sharing and Assimilation

Apparently users put value into the content being nearly as correct as possible but why is that so? Could it even be that the ideal of correct information hinders users to contribute to avoid different perspectives of insecurity by appearing incorrect? Our theory sections tell us there are many reasons not to contribute and one may be the fear of being exposed to critics. However, in that case most users said that they didn't acknowledge the importance of the issue and by minimise the level of importance of Krogh's (1999) statement that brusque, austere attitude and harsh judgment by other participants in knowledge creation could be a reason not to contribute. Another reason for not sharing information as suggested by Ives et al. (1999) and Davenport and Prusak (1998) may be the insecurity of not knowing what happens to information after the contribution is made. That suggestion got no support from our interviewees and many pointed out the similarities with any kind of information sharing that they already are used to.

Davenport and Prusak suggests that it can be barriers when it comes to give knowledge to or accept it from people in the organisation who have relatively low status. What the researchers mean here is not clear. There may be many reasons to not accept information from someone with low status; one can be of prestigious causes. It can also be of an insecurity that's based on the mere fact that the two persons perceive different areas of the organisational context that form their way reasoning, i.e. which are the important variables to consider and so forth. In that case, listening to someone with lower organisational status might affect the correctness of the output. However, there were no indications at all that supported this suggestion. Almost reason not to share which all users distanced them from, was the thought of keeping valuable information.

Therefore we downsize the importance of Von Krogh (1998) and Ives et al:s (1999) statement suggesting that unique possession of knowledge is seen as power and job security.

Another source of confusion that in the least could slow down the process of knowledge sharing, and in worst cases affect the correctness of content, is different vocabularies and frames of references as suggested by Ives et al. (1999) and Davenport and Prusak (1998). According to our study, most users understood what's being communicated and some said the reason was their backgrounds as chemists. By that it is also possible to lessen the importance of this issue in the studied context.

It apparently exists a common understanding of what is being communicated in the wiki, but being able to communicate successfully doesn't automatically imply that the contributor doesn't matter. Therefore it's interesting to know whether personal recognition of the contributor of content mattered. In that case our interviewees more or less shared a unified opinion where they agreed upon the importance of who the contributor is, arguing that personal recognition created by previous qualitative contributions is the main reason for trust. It may seem contradicting when compared to the answers gained when asking about user's trust in the correctness of content. The results suggest that employees seem to regard each other's actions of being of good intentions and that they are skilful enough to provide a qualitative content. That in turn, makes the employees think content is trustworthy. This leads us to an interesting, perhaps contradicting question: how can employees trust each other and at the same time underscore the importance of the contributor? Actually it doesn't have to be a contradiction, just because users have more faith in persons who they know previously has delivered high quality material, it does not imply that they can't feel trust in other employees as well.

One reason though, is that we noticed that the interview results indicated that some users might have thought about wiki in different scopes. This is not very surprising since the user group consisted of some users with little or none connection at all to the active pilot. There were also some users who primarily participated in the wiki pilot to learn the application and seemed to pay no interest to the available content, whoever the contributor was. Therefore we suggest that these users thought of wiki in a more general sense compared to others who thought of the wiki as in our specific pilot. Answers that highlight the importance of personal recognition generally seem to be the case when users think of wiki in a narrow sense such as the wiki pilot. And on the other hand, the shared view that other employees generally act in good intentions does seem to be related to users who thought of wiki in a broader sense. This difference in scope when relating to wiki could perhaps shred some light into the contradiction of the existence of general trust and the importance of personal recognition. But the evidence supporting those conclusions is weak and needs more support to be verified. Instead we rather consider personal recognition and belief in the correctness of content contributed by others, as of complementary nature. Even though we lacked empiric evidence to prove their differentiated views when relating to wiki, the evidence is still enough to prove the existence of trust and by that also the support for a precondition for successful KM suggested by Von Krogh (1999) and Davenport and Prusak (1998).

Continuing down the road of reasons not to contribute, Davenport (1997) suggests that the sharer of information might run the risk of being forced to give time-consuming support to answer further questions generated by the shared information. On this point almost all users disagreed upon that risk being present at all in the organisation. However there were some contradicting

thoughts as well. One user concluded that if a contribution generated hundreds of questions, then it could be problematic. Another user acknowledged the problem of generally being of great proportion but hadn't reflected much upon it while working in the wiki. Even though only a minority of all users held these opinions, it is worth mentioning in the perspective of organisational maturity towards KM and primarily the sharing of information. It's also important to take into account that the required engagement in terms of time invested in system usage will differ depending on the chosen design of wiki variables like accessibility and purpose, and of course the level of interest generated by the actual contribution. However, the interesting point here is the users' views on future knowledge supporting applications. Apparently most users can't imagine a situation that requires engagement far from the situation they're witnessing today since they generally can't imagine a potential overflow of requests of their attention in matters within their areas of knowledge. If IT-support is in place that enables the utilization of the full potential of available knowledge in the organisation, then more answers could potentially be found by using cooperative intelligence instead of performing the necessary work themselves. This may lead users to a new situation centred in the trade-off between the value of insights gained by individually performed work and valuable insight that could be found in a system generated by multiple individuals. This is a situation far from what the users experience today. Therefore we suggest by judging from the users' view on knowledge sharing by request to support the entire organisation in it's harvesting of available knowledge, is in an immature phase.

5.2.2 System Usage

Another variable that potentially could affect the level of correctness in contributions is the amount of time needed to create contributions of sufficient quality to avoid misunderstandings. In this matter all users agreed that a lack of time could be a reason not to contribute, which also verifies a statement by Dixon (2000). So, the situation we are up against consists of empirical evidence that supports the view that users are willing to contribute and a complete absence of reasons not to contribute. If users want the content to be trustworthy it needs time to assure that it aligns well with the ideal of near perfectly correct content. What if there is a lack of time, does that imply that no contributions will be made? Why does contributions have to be complicated and by that time-consuming? The degree of complication may depend on the type of content that is to be published. Is it content where others, i.e. scientific articles, perform reasoning? Or is it contributions where the actual contributor's thoughts are in focus? Or is it perhaps both? In this case the purpose of the wiki is likely to affect what type of contribution is to be made. The ending note is that different types of contributions affect the individual in different ways concerning the amount of time required.

Let's continue by shifting focus to other variables that could affect the success of wiki interaction. Simple logic states that employees who want to be able to contribute must know how to contribute. In this sense almost all users claimed they knew how to contribute in a valuable way. And by that we can verify a central pre-requisite for successful KM that states the importance of how organisations clearly should promote in which ways the employee could contribute (Ardichvili et al, 2003; Davenport & Prusak, 1998; De Long & Fehey, 2000; Ives et al, 1999).

Knowing how to contribute with value is not enough though; employees also have to be motivated to perform the actual contribution. This relationship between motivation and valuable

outcome was confirmed by the entire users group and by that also the support for a precondition of Ardichvili et al:s (2003) statement. A statement that suggests that one of the critical factors determining a virtual community's success is its members' motivation to actively participate in community knowledge. However, we did not prove that motivation had anything to do with the knowledge generation and sharing activities. We've just found empiric evidence that supports the importance of motivation among wiki users. Further, it may seem contradicting when comparing a wiki with low user interaction, which was the case with the pilot, with variables of importance when considering a fully developed virtual community of practice. However, if users are motivated to add content then the full potential of the wiki will follow in time.

If motivation was an important cornerstone in the context of system usage, the main reason to use a system was that it helped in performing usual work. Three of the users had an individual focus on their own work when thinking about "usual work"; while two other users says that they would use a system for as long as it was useful to anyone in the organisation. Among these five users there were three users who strictly pointed out that they needed to find valuable content before they started to contribute. But different users mean different things when they think of usual work by the mere facts that they have different roles in the organisation. Their shifting associations when thinking of wiki are also evident in our empiric material. Some users primarily see the wiki as a project-supporting tool whereas others relate to it as a tool for supporting areas of knowledge. When using wiki as a reporting tool contribution without retrieval may be a part of usual wiki usage. On the other hand, when wiki is used to support a knowledge area the relevant wiki usage may be to initially find useful information instead of contributing material. The aim of this reasoning is to highlight the differences in initial system interaction. It may not seem noteworthy but the difference may be of great scope and suggests two types of user behaviour when it comes to contribution of content: (1) Individual contribution to create value for others, and (2) Seek existing value for individual benefit, then contribute to create value for others. To achieve successful initiation of a wiki a majority of all users should preferably consist of the first type of contributor.

5.2.3 Integrity and Patent Issues

This ideal of correct information also aligns well with an issue of integrity that surfaced in the interviews. If the ideal underscores the importance of correctness then it's pretty straight forward that exposing someone else for not being correct isn't desirable neither by the contributor nor the exposed person because it might hurt them both. Therefore is it important to keep a distance to other employees by only contributing facts that can't affect their integrity in any harmful way and that it's related to work as well. A complementary solution, as mentioned in the interview, is that if something was contributed in the wiki that was closely related to someone else, then the related person should to be notified about it to be able to correct it if needed.

The discussion above has been focused on individual reasons for correct information, but our empirical evidence suggests that there are demands that are derived from the organisation as well. However, it is impossible to take into account all the different roles that different users have. Noteworthy though on a general level, is the issue of patents. This is an issue where the stakes are extra high when considering one of the main features of wiki – its rapid contributions. Therefore one big challenge is how to share information when the patent issue forces the hoarding of new knowledge to avoid patent issues. The issue was also confirmed by users who stated that attempts

on knowledge sharing have earlier been hindered by the fear of patents being available to the wrong people. The result is a paradox situation that is unavoidable due to the fact that patents are perhaps the most central business area within the organisation, and yet knowledge sharing is crucial to achieve performance in KM. However our study isn't aimed in that direction and to better understand which design implications the patent issue involves we can only conclude that further research has to be conducted.

5.3 Wiki Perspectives

In this section we connect the results from the second interview phase with the theory regarding key aspects of the different wiki perspectives, which can be found in Theory: Focus.

5.3.1 Content

In our theory section we pointed out the need of carefully choosing which users to include in a group. This is important since it is the users who contribute with content, an opinion that the interviewees shared as well. Therefore one aim when forming a group is that there are common information needs so that there is a higher probability that its users regard the information as relevant. To clarify which those common information needs are a clearly stated purpose is needed, which several of our interviewees confirmed. They also suggested that users should take part in the discussion that ultimately would lead to the definition of a purpose.

Stating what kind of content and behaviour to expect may also lead the users to greater awareness of what is legitimised acting when using the system and thus avoid doing things that otherwise would have needed protection in the form of restrictions. A clear purpose is of extra importance in the initial phase of the implementation of a wiki since its empty from the start and it's only when users reuse content that the system creates real value. And if there is a lack of real value, it is likely to result in system avoidance when users can't find any real value by using the system.

Continuing with the discussion about clear purpose Hiltz and Turoff (1985) suggested that size and diversity in a user group are important variables when defining a purpose because when they increase, as a result of group growth, it has an impact on the implicit trade-off between irrelevant content and potential useful information. Size and diversity may also be related to the process of knowledge creation via the linkages between individuals and groups sharing similar tasks, which is known as communities of practice. These communities of practices are important when it comes to communicating and sharing of knowledge (Hahn & Subramani, 2000). However the downside, as stated by many researchers, is that different communities have their own unique and context-specific vocabularies that, while facilitating knowledge exchange within the community, impede communication between them (Davenport & Prusak, 1998; Ives et al., 1999; Hahn & Subramani, 2000; Small & Sage, 2005). If users have problems in understanding each other and are not certain about how much knowledge other users' possess, the result could be that user doesn't include enough contextual descriptions in contributions. And without adequate contextual description surrounding the knowledge creation, it is questionable whether storing the knowledge will result in effective use (Alavi & Leidner, 2001).

By that we once again highlight the importance of the need to discuss the scope of the purpose with variables like size, diversity in the sense that if the purpose spans between different

communities of practise there might occur a communication problem between individual users from different communities. We also address the connection between different frames of reference and the importance of contextual description.

What's contrasting compared to the earlier discussion about the scope of a wiki, is that several interviewees claimed that it is desirable to have as many users in a wiki as possible. The only downside they acknowledged were that there'll always be some individuals that participate more than others based on that they have a greater interest in sharing knowledge. In this contradicting matter, we believe that since the user group consisted of such a few users and that no cooperative efforts were found in the wiki pilot, it's not very likely that the interviewees understood the magnitude of issues derived from an increase in size and diversity.

In the discussion above we talked about the implications of size and diversity among users. In the following discussion we will switch perspective, still viewing a similar issue, but with a focus on actual content. The more readily available the knowledge is, the more likely its reuse (Alavi & Leidner, 2001). However what could be an opportunity could in this case also be turned around to an issue because the more readily available information is, the greater the likelihood of knowledge misuse, i.e. knowledge being misapplied to a different context (Alavi and Leidner, 2001). Misuse could also occur when information isn't correct, and that is something that could easily happen since the wiki concept favours quick contributors over any kind of reviewing. In this case our users acknowledged that there is a conflict between the information correctness and the dynamic nature of a wiki, dynamic in the sense that it's based on quick contributions of unstructured information. However, if they were to choose, users generally state that they would prefer the advantages gained from the dynamic nature of a wiki at the expense of perfectly correct content. Incorrect content may also be corrected at a faster pace when users easily can change content on their own. It's also important to acknowledge that different types of content may be differently sensitive towards correctness. That's why it could be beneficial to discuss the level of sensitivity in particular cases to form a unified view expressed in the purpose.

Another reason why the wiki concept is favourable to use in KM, is because users generally can modify content and by that prevents the issue described by Alavi and Leidner (2001) about how today's knowledge may be tomorrow's ignorance in the sense that knowledge emerges.

We also asked our interviewees about the need for an organisationally expressed vision about the system, something that they agreed upon. However the distinction of vision and purpose is weak and we cannot draw any new conclusions compared to those drawn from the users expressed need for a purpose.

5.3.2 Structure

The wiki pilot we conducted had a main disadvantage, the time frame. This issue meant we couldn't study certain aspects of the wiki concept, for example the structure of the dynamic nature of a growing wiki environment. The page growth within the wiki pilot was quite limited.

Our users felt the initial structure was enough and most forms of navigation were by using the tree view on the front-page. However, the users realized that as the wiki would grow, the more important the need of a well-functioning search engine since the main way of navigation would

be by using the search engine. Buffa (2006) clearly states that navigation; orientation and search become more difficult as the wiki document grows, due to the open structure of the wiki. Like mentioned earlier, this problem hasn't occurred in our pilot due to lack of a large document base, but the users have problems with this in other information systems within the company today, and therefore realise that search capabilities has a large part in the success of a wiki.

The software we used in our pilot, Confluence, has the option of creating several wikis within one large wiki environment. Atlassian, the company behind Confluence, has chosen to implement this functionality due to the complexity of many organisations today. According to Buffa (2006), wiki spaces create structure while being transparent and this is something we believe has several different benefits. First of all, different departments, project groups or knowledge areas can create their own wiki, using what they believe is the most suitable structure and the content they feel is the most relevant. This will also help the search engine to make more directed searches in different areas. The users also stated that the problem with a company wide approach is that solutions tend to be too generic. For example, they saw a problem with the current intranet, which was designed to make everything look the same, which lead to users not always knowing where they were, and the logic of the structure didn't reflect what was logical to them. In our pilot, we chose to use the department of PAR&D's, in which the Poorly Solubles group was located, colours to make it obvious where the users were when navigating in the wiki environment. For example, the people directory in which all users have their own page uses the colours of AstraZeneca, so by navigating between the transparent spaces within the wiki, it's easy to know in which space you are at the moment.

Buffa (2006) gives an example of a wiki that failed due to the lack of resemblance between the structure of the company and the structure in the wiki environment. Depending on how you interpret the meaning of the company structure we feel this statement is true for AstraZeneca. We don't see the wiki as sole intranet solution, but rather a support for different functions such as projects, knowledge groups, departments etc. Therefore, the structure of the wiki shouldn't reflect the company's structure but instead reflect the structure of the smaller groups that works with a particular wiki space. We feel the most important thing is that the structure reflects the users' view of the structure within a certain domain. The larger and more complex a company's structure is, the less useful it is to adapt in the wiki environment, it's more likely to create confusion rather than order to the actual user.

Our users had quite similar thoughts about how the development of the structure would look like. The initial structure should contain only the most important things for the given purpose of the wiki and should be created by the person in charge of that space. Some users said that it would be a good thing if the ground structure followed some sort of guideline for all wikis, to lower the threshold of introduction for each new space. This is something we believe the organisation should be very careful with. One of the strengths within the wiki is that it is user-generated which means it fits well with the users need, and if generic guidelines control the creation within the wiki, it can result a lower participation. We do think the user has a point, but we feel it's important to review these guidelines carefully before implementing them. When the ground structure is created, most users felt that the development of structure should be in the hands of the users, but the responsibility of making sure the structure is maintained should still lie under the person in charge of the wiki space.

As the wiki grows, our users expressed a need for people to administrate the structure of the wiki, making sure the structure reflects the content and the users' logic view of the domain at hand. This is something we feel is necessary as the employees of AstraZeneca have a limited time to work on tasks that aren't closely related to their main duties. In for example Wikipedia, the users spend their spare time and can put in as much effort they like on wiki related work. There is a clear difference and for the structure to develop well, which is a key factor to success, we feel that this is something important to look at.

In the theory related to structure a lot of attention was brought to tags (Confluence uses the term *label*). The benefits of tags are mainly visible as the wiki document base grows, and even though we encouraged our users to use them, we don't feel that we can draw any conclusions from the use of these in the pilot. We did recognize that the users had problems with the information systems' search tools within the organisation today and tools creating search capabilities closer to the users own vocabularies are something we do feel is important, especially in such a large organisation as AstraZeneca. We also believe that tagging material is something the users need to be educated in; they need to realise the importance of using tags and the benefits brought to them by tagging material.

5.3.3 Functions

5.3.3.1 User Interface and Navigation

The users say that the graphical user interface in the wiki pilot was a positive experience, with the exception of some minor issues. The attitude towards the user interface has to some extent to do with how much the user actually uses the wiki. Many of the users haven't used the wiki pilot for a greater amount of time, but it is positive that the threshold to getting used to the wiki and its user interface is relatively low. Overall, the users found the graphical user interface and the functions to be logical and that many features are recognises from other systems. This is an important aspect; to make sure that using the wiki is not greatly different from already existing systems. This makes the threshold of learning the wiki decreased.

The viewpoint of Hellström (1999) is that the way a graphical user interface is built up, with different features, and the way information is displayed has a great impact on how the user can perform work tasks. This is something that all the interviewed users agree with; if the system isn't easy to understand then the work tasks that must be performed is not performed in an optimal way. Hellström (1999) explains that the responsibility of the designer of a user interface is to make sure the system is shaped in a natural way after how the users work and communicate. In the response we have received from the users we can clearly say that the graphical user interface has a major impact on how a system is received by the individual user. The users found the wiki pilot's interface to be easy-to-use, and easy to adopt since it looked similar to already existing IT-tools.

Generally, wikis uses a simple browser interface, which makes the wiki an ideal tool for collaborative editing (Schaffert, 2006). It is important to keep the simplicity of the user interface or else it may prevent the users from using the system. One of the advantages of the wikis is its easy editing mode and this was a very useful feature according to the users. It made the adoption

to the wiki easier. The users explained that the wiki pilot overall had a good user interface, which didn't prevent them from using the wiki to its fullest extent.

Lorentzon (2006) explains in his study that the WYSIWYG-approach is very successful when implementing a wiki in an organisation. This is something we agree with and can verify since we in the wiki pilot used a WYSIWYG-approach with easy editing and visual icons. The users were very positive that it was easy to edit and publish information. Hence, we think that the graphical user interface of a wiki should be user-centred, and that it is positive to use a WYSIWYG-approach.

In a general sense, Hellström (1999) emphasises on keeping navigation in systems logical. The navigational possibilities should be placed in a logical order. Further, the author claims that it may be difficult to use the navigation if the connection to the reality isn't obvious. Also, if the system is too big there may be difficulties in understanding where one is positioned in the system, and this is a problem related to the use of several menus on several different levels. Hence, navigation in systems, such as the wiki, can be time-consuming and this may be prevented by organising the content logically in hierarchical levels, without the use of too many menus. The users view concerning the navigation possibilities in the wiki was positive, although a few of them had some minor issues. But overall the users found the navigation to be logical and that it was relatively easy to connect the wiki space and its hierarchy to the knowledge area.

Lindström (1999) claims that the insight in the users' view of the graphical user interface is what is going to determine if a system will help the user. The user interface and navigation should be intuitive and easy to use. The author further claims that the central aspect is the user's mental model of the new system, as this may not be aligned with the designer's mental model of the system. In accordance to this it is necessary that the navigation functionality is attractive, robust and easy to understand. Further, Lindström (1999) says that poor support for navigation can be reversed by having a more central and structured approach, and by having a search function. The interviewed users claim that the wiki's navigation was functional, for example the hierarchical level that was displayed on top of each page was found to be very useful. The need of having an intuitive navigation and an easy structure is very important. It makes using the system easier as it shouldn't take a long time for the user to understand how to get from one page to another. The search function was very helpful according to the users, which would like the search function to be expanded to include other IT-solutions, for example databases, in the organisation. We think that the search function is a central tool for finding information quickly, as it may not be always be obvious were to find information in the hierarchical structure.

5.3.3.2 Anonymity and Restrictions

Access to information is unrestricted in many wikis, hence enabling the users to correct, modify, complete, or even delete pages (Schaffert, 2006). Closely connected to access to information is the issue of anonymity. The users are united that anonymity shouldn't take place in a wiki, and the users mention several reasons. For example, it is useful to see the publisher's name if there is something that the user wants to discuss or ask the publisher regarding the information. The users also mean that anonymity increases the risk of the wiki being misused, and that the information may not be trusted. Several users also say that the use of anonymity goes against the whole

concept of the wiki, based on openness of sharing information. Hence, it is preferable not to use anonymity in a wiki.

Regarding the use of restrictions, earlier research in the field states that allowing unrestricted use might seem strange, and even dangerous, from a traditional perspective (Schaffert, 2006). Some wikis still allow applying further access restrictions using users and groups as found in traditional content management systems (Schaffert, 2006). Most of the users are negative towards using restrictions in the wiki. They argue that using restrictions may prevent the purpose and the openness of the wiki. Several of the users acknowledges that the purpose of the wiki and its vision in some way determine how restriction should be used. Restrictions should be applied carefully, and in accordance to the purpose of the wiki.

Finally, an interesting thought is to reverse the assumption of anonymity not being desirably and imagine a situation where anonymously instead may be favourable. One example is a situation where personal recognition may hinder the challenge of existing ideals because users don't want to criticise the person responsible for the contribution for different reasons, which in turn might limit the organisational potential for innovation.

5.4 AstraZeneca-wiki in the wider context

In the following discussion we will reflect upon the issue of creating valuable content in the initial stage of the evolution of a base of knowledge. The discussion will be aimed at approaching the issue at two different levels in the abstraction and the outcome is of great importance for any global knowledge organisation striving to be able to utilize the full knowledge potential within the organisation.

5.4.1 The Quest for Relevant Content

In this thesis wiki has been used as a KM tool. One of the greatest issues was to get users to contribute with content without getting anything in return. Even though users wanted to share knowledge and had the required tools to support them in their actions, it was still not enough to create a base of valuable content in terms of knowledge reuse. Therefore this issue of knowledge storage is of central importance in the initial phase in the creation of a knowledge base in any KM application. The typical kind of user behavior in this situation consists of sporadic contributions of content resulting in an incoherent base of knowledge that lacks interest for anyone else except maybe for the actual contributor. To overcome this initial step in the evolution of an empty KM tool and proceed towards a valuable state where new knowledge gets created or reused, content has to be relevant for the users. And since users are the ones responsible for the contribution of content to the system, the issue lies in getting users to understand what other users want. To overcome the issue we will describe two different approaches that are likely to result in different outcomes. One way is to have a clear purpose that guides contribution initiatives to fit into a predefined domain of knowledge. Answers found in this type of knowledge base may be unpredictable in the sense that solutions might not be tailor made to the actual issue in question resulting in the possibility of both a less and more valuable outcome. And since this type of alignment of user contributions has an unpredictable outcome, it may be favorable in terms of

innovation. Another approach is centered on the formulation and publication of questions performed by users. The answers to these questions are then to be provided by other users. The type of answers found in this approach are likely to be tailor made which results in a predictable outcome that results in the reuse of knowledge.

5.4.2 The Issue of Personal Recognition

The situation we will look into focuses on how IT can support organisations by connecting spatially divided employees. The core of the issue lies in having trust in other employees without previous established relations. This issue is particularly important in the initial phase of the formation of a globally supporting collaboration tool. This is the case since it is most likely that employees that lack awareness of other employees' skills will be confronted in the quest for knowledge. Therefore a solution to the problem lies in understanding how to motivate employees to abandon their precious trust in personal recognition in the quest for globally available knowledge. Employees must be aware of who knows what and have trust in that person even though no previous records of possessed skills exist. Only then will it be possible to harvest the full knowledge within the organisation.

One key factor may be to promote the awareness of the possibilities to perform their work more efficiently, which the empiric evidence suggests is their main driving force for system usage. But since the reason for the existence of personal recognition is to ensure the quality of content, it can be troublesome to share knowledge in a forum that lacks this bound of trust. So, to further concretise the challenge – it's about lowering the gap between what employees believe is valid information, and anonymous contributors, or in other words – how to make employees trust unknown contributors.

Alavi and Leidner (2001) stated that the capturing of sufficient contextual description surrounding knowledge creation could prevent inefficient uses. But that type of solution will not hinder the application of incorrect knowledge in a correct context since knowledge could be applied without knowing why. And it is the *knowing why* or justification of knowledge that we suggest could be a key to unravel the issue of how to make employees trust unknown contributors.

A solution to the justification issue may be found in the works of Kollock performed in 1999. The researcher highlighted the value of personal recognition which is one of the factors the justification issue is derived from. The study performed by Kollock was executed in a non-organisational context and thus may not be valid in the context which this study takes place. But to further clarify we need to examine the root causes and desired outcome of the issue in relation to our current issue.

One difference is found in the way persons approach the two different issues since the issue of justification is rooted in the anxiety that may rise when assimilating or using knowledge that may be incorrect. The issue described by Kollock (1999) on the other hand is rooted in a person's drive for achieving personal recognition by assimilation and later use of knowledge. To put it short, the first one is aimed at avoiding misuse of knowledge and the other is aimed at using knowledge to achieve desired personal value. Even though the outcome of the different approaches of contribution may be similar in terms of actual value in the sense that it helps to

solve one or more similar issues, their motives are of different nature. Therefore we conclude that personal recognition is a central theme in both issues but personal recognition is viewed from two alternative perspectives that is rooted in different causes and thus requires different solutions to reach desired outcomes of respective solution.

To summarise the conclusions drawn in this discussion we found that neither related theory by Alavi and Leidner (2001) nor Kollock (1999) proved to be sufficient to provide us with a sustainable solution. Therefore we need to create our own.

The solution we propose is an extension of the solution suggested by Alavi and Leidner (2001) about contextual description to include transparent reasoning. Transparent reasoning is about making the reasoning in a contribution visible in an obvious way to let the reader decide whether the content is trustworthy or not at the expense of some extra time. The effect is valuable in two ways: (1) increased likelihood of acceptance of the content by the receiver and (2) employees rate of contribution will increase now that they feel more secure about contributing by the justification of their actions.

5.5 Suggestions on Future Research Studies

Regarding future research studies that can be connected to this study, we suggest that it would be interesting to evaluate the impact that the wiki has on a knowledge organisation in the longer term. The wiki as a KM-tool is based on an organic growth that is dependable on usage in a longer term. Hence, on opportunity to make further research is to investigate how a wiki develops over a longer period of time, perhaps over a span of three to five years. One opportunity to do further research is to develop a wiki that is used in a more extensive way in a knowledge organisation. In this study we focused on a relatively small user group and it would be interesting to see the results of a study that investigates a broader wiki usage.

6. Conclusion

In the conclusion we give an answer to the research issue: Which are the key aspects when introducing the wiki concept to a knowledge organisation? In this thesis we have identified key aspects in the initial phase of the evolution of a wiki within four perspectives: culture, content, functions and structure.

Culture
Motivation is important to create valuable outcome of wiki usage. The most important reason for wiki usage was that it helped in performing usual work. A lack of time is the main reason not to use the wiki.

Content
Awareness of the implications of rapid contributions existed and still users thought rapid contributions was beneficial. Primarily two risks involved were involved with rapid contributions, (1) the risk that anxiety may arise when too much suspicion exists concerning the validity of the available content, and (2) the risk of knowledge being applied in an incorrect context. A clear purpose is needed to align users resulting in an acceleration of the evolution of the wiki into a beneficial state where users receive value from system interaction.

Structure
Structure should be managed by a chosen user who should create a basic ground structure with the most important information for the particular purpose of that wiki. All users will then develop the structure as it suits the community of users with the responsibility lying with the person in charge. Customized, smaller wikis is important to support the needs of small groups, and to lower the generic influence of the organisation. In this matter attention also has to be paid to balance benefits gained from generic guidelines to lower the threshold for users getting introduced to a new space within the wiki. It's important to use tags to support the search engine that will be central in the navigation of the wiki, as its document base grows larger.

Functions
WYSIWYG graphical interface is crucial to lower the technical threshold. Anonymity shouldn't be used in a wiki in a knowledge organisation because it's in some way contradictory to the whole wiki concept, based on openness. There is also an aspect of personal recognition connected to the published content, which may be missed if anonymity is used. Restrictions are something that can be used in a wiki, but should be applied carefully.

References

Alavi, A., & Leidner, D. E. (2001). Review: Knowledge Management and Knowledge Management Systems. *MIS Quarterly*. Vol. 25, No. 1, pp. 107-136.

Ardichvili, A., Page, V., Wentling, T. (2003). Motivation and barriers to participation in virtual knowledge-sharing communities of practice. *Journal of Knowledge Management.* Vol. 7, No. 1, pp. 64-77.

Atlassian Confluence
<http://www.atlassian.com/software/confluence> [2007-04-12]

Aumüller, D. (2005). SHAWN: Structure helps a wiki navigate. In *Proceedings of the BTW-Workshop WebDB Meets IR*.

Bair, J., Fenn, J., Hunter, R., & Bosik, D. (1997). Foundations for Enterprise Knowledge Management. *Strategic Analysis Report*. Gartner Group. Stamford.

Bandura, A. (1995). *Self-Efficacy in Changing Societies*. Cambridge, UK: Cambridge University Press.

Buffa, M (2006). Intranet wikis. Intraweb workshop. *WWW Conference 2006*, Edinburgh.

Choo, C. W., Detlor, B., & Turnbull, D. (2000). *Web Work: Information Seeking and Knowledge Work on the World Wide Web*. Dordrecht, Netherlands: Kluwer Academic Publishers.

comScore Press Release
<http://www.comscore.com/press/release.asp?press=1193> [2007-03-26]

Constant, D., Sproull, L., & Kiesler, S. (1996). *The Kindness of Strangers: The Usefulness of Electronic Weak Ties for Technical Advice*. *Organizational Science*. Vol. 7, No. 2, pp. 119-135.

Davenport, T.H. (1997). *Information Ecology*, Oxford University Press, New York, NY.

Davenport, T. H., & Prusak, L. (1998). *A Synopsis of: Working Knowledge: How Organizations Manage What They Know*. Training Resources Group, Inc., pp. 1-13.

Decker, B., Ras, E., Rech, J., Klein, B. & Hoecht, C. (2005). Self-Organized Reuse of Software Engineering Knowledge Supported by Semantic Wikis. In *Workshop on Semantic Web Enabled Software Engineering (SWESE)*. Galway, Ireland.

DeLong, D. W., & Fahey, L. (2000). Diagnosing Cultural Barriers to Knowledge Management. *Academy of Management Executive.* Vol. 14, No. 4, pp. 118-127.

Dixon, N. (2000). *Common Knowledge: How Companies Thrive by Sharing What They know*, Harvard Business School Press, Boston, MA.

Dingsøyr, T., & Røyrvik, E. (2003). An Empirical Study of an Informal Knowledge Repository in a Medium-Sized Software Consulting Company. In *Proceedings of the 25th International Conference on Software Engineering* (pp. 84-92). Portland, OR.

Dworman, G. (1998). *Discovering Patterns in Organizational Memory*. Working Paper, Massachusetts Institute of Technology.

Easterby-Smith, M., Thorpe, R., & Lowe, A. (2002). *Management Research – An Introduction*. Trowbridge, UK: The Cromwell Press Ltd.

Glazer, R. (1998). Measuring the Knower: Towards a Theory of Knowledge Equity. California Management Review. Vol 40, No 3, pp. 175-184.

Golder, S. A. and Huberman, B. A. (2006). Usage patterns of collaborative tagging systems, *Journal of Information Science*. Vol.32, No.2, pp.198-208.

Gonzalez-Reinhart, J. (2005). Wiki and the Wiki Way: Beyond a Knowledge Management System. *Information Systems Research Center*. February, pp. 1 – 22. <http://www.uhisrc.com/FTB/Wiki/wiki_way_brief%5B1%5D-Jennifer%2005.pdf>

Hahn, J., & Subramani, M. R. (2000). A framework of knowledge management systems: issues and challenges for theory and practice. In *Proceedings of the twenty first international conference on Information systems* (pp. 302-312). Brisbane, Australia.

Hellström, J., & Nilsson, M. D. (1999). *Riktlinjer vid design av användargränssnitt samt Internet Explorer vs Netscape Navigator - en studie i design och användarvänlighet*. Department of Informatics, Göteborg.

Hiltz, S. R., & Turoff, M. (1985). Structuring Computer-Mediated Communication Systems to Avoid Information Overload. In *Communications of the ACM* (680-689).

Hjørland, B. (2007). *What is Knowledge Organization?* <http://www.db.dk/bh/Lifeboat_KO/CONCEPTS/knowledge_organization.htm> [2007-04-06]

Ives, W., Torrey, B., & Gordon, C. (2002). Knowledge sharing is a human behavior. *Knowledge management: classic and contemporary works (eds) D. Morey, M. Maybury & B. Thuraisingham,* 99-129. Cambridge, Mass. MIT Press.

Jacob, E. K. (2004). *Classification and categorization: a difference that makes a difference*. Library Trends.

Kim, A. J. (2000). Community *Buiding on the Web: Secret Strategies for Succesful Online Communities*. Berkeley, CA: Peachpit Press.

Koch, C. (2003). Open Source: Your Open Source Plan. <http://www.cio.com/archive/031503/opensource.html> [2007-04-07]

Kollock, P. (1999). The economies of Online Cooperation: Gifts and Public Goods in Cyberspace.
<http://www.sscnet.ucla.edu/soc/faculty/kollock/papers/economies.htm> [2007-03-27]

Krause, J. (2004). A Wiki-wiki Way to Work. *ABA Journal*. Vol. 90, No. 12, pp. 61.

Labov, W. (1973). The boundaries of words and their meanings. In Bailey, C. J. and Shy, R. (eds), *New Ways of Analyzing Variation in English*, pp. 340–373.

Lindström, M. (1999). *Att navigera på webbplatser - en dynamisk lösning för decentraliserat ansvar*. Master Thesis. Department of Informatics, Göteborg.

Lorentzon, R., & Sandin, C. (2006). *Intranätdesign för ökad kunskapsdelning*. Master Thesis. IT University of Göteborg.

Majchrzak, A., Wagner, C., & Yates, D. (2006). Corporate Wiki Users: Results of a Survey. In *WikiSym 2006* (pp. 99-104).

Malhotra, Y. (2002). Information Ecology and Knowledge Management: Toward Knowledge Ecology for Hyperturbulent Organizational Environments. *Encyclopedia of Life Support*. UNESCO/Eolss Publishers, Oxford, UK.

Mathes, A. (2004). Folksonomies – Cooperative Classification and Communication Through Shared Metadata. *Computer Mediated Communication*, LIS590CMC (Doctoral Seminar), Graduate School of Library and Information Science, University of Illinois Urbana-Champaign.

Mayer, R. C., Davis, J. H., & Schoorman, F. D. (1995). An Integrative Model of Organizational Trust. *Academy of Management Review.* Vol. 20, No.3, pp. 709-734.

McKnight, D. H., Cummings, L. L., & Chervany N. L. (1998). Initial Trust Formation in new Organizational Relationships. *Academy of Management Review.* Vol. 23, No.3, pp. 473-490.

MeatballWiki: SoftSecurity
<http://www.usemod.com/cgi-bin/mb.pl?SoftSecurity> [2007-05-25]

Merholz, P (2004). *Metadata for the Masses*.
<http://www.adaptivepath.com/publications/essays/archives/000361.php> [2007-04-14]

Mulder, D. H. (2006). The Internet Encyclopedia of Philosophy – Objectivity.
<http://www.iep.utm.edu/o/objectiv.htm> [2007-04-12]

Myers, N. (1989). Environment and Security. *Foreign Policy*. No. 74, pp. 23-41.

Newell, S., Scarbrough, H., Swan, J., & Hislop, D. (1999). Intranets and knowledge management: Complex processes and ironic outcomes. In *Proceedings of the Hawaii International Conference on System Sciences*. Los Alamitos, CA, USA.

Nonaka, I. (1994). A Dynamic Theory of Organizational Knowledge Creation. *Organization Science*. Vol. 5, No. 1, pp. 14-37.

O'Leary, D. E. (1998). Enterprise Knowledge Management. *IEEE Computer*. Vol. 31, No. 3, pp. 54–61.

Polanyi, M. (1966). *The Tacit Dimension*. First published by Doubleday & Co, 1966. Reprinted by Peter Smith, Gloucester, MA, 1983.

Pustejovsky, J. (1995). *The Generative Lexicon*. Cambridge, MA: MIT Press.

Quintarelli, E (2005). *Folksonomies: power to the people*. Paper presented at the ISKO Italy-UniMIB meeting.

Reliability, from writing guides at Colorado State University <http://writing.colostate.edu/guides/research/relval/pop2a.cfm> [2007-03-24]

Roth, J. (2003). Enabling knowledge creation: learning from an R&D organization. *Journal of Knowledge Management*. Vol. 7, No. 1, pp. 32-48.

Schein, E. H. (1988). *Organizational Culture*. Unpublished Paper, Sloan School of Management, Massachusetts Institute of Technology.

Small, C. T., & Sage, A. P. (2005). Knowledge Management and Knowledge sharing: A review. *Information Knowledge Systems Management*, No. 3, pp. 153-169.

Smith, M. A. (2007). *Voices from the Well: The Logic of the Virtual Commons*. <http://www.sscnet.ucla.edu/soc/csoc/papers/voices/Voices.htm> [2007-04-02]

Schaffert, S. (2006). *IkeWiki: A Semantic Wiki for Collaborative Knowledge Management*.

Stenmark, D., & Lindgren, R. (2003). Intranets for knowledge management: Applications affording User participation. In *Proceedings of AMCIS (*pp.2600-2606). Tampa, FL.

Stenmark, D. (2003b). Knowledge creation and the web: Factors indicating why some intranets succeed where others fail. *Knowledge and Process Management*. Vol. 10, No. 3, pp. 207-216.

Stenmark, D. (2005). Knowledge sharing on a corporate intranet: Effects of re-instating web authoring capabilities. *Proceedings of ECIS 2005*. Regensburg, Germany.

Stewart, T. A. (2002). The Case Against Knowledge Management. *Business 2.0*, February.issue.

Swan, J., Newell, S., Scarbrough, H., & Hislop, D. (1999). Knowledge Management and Innovation: Networks and Networking. *Journal of Knowledge Management*. Vol. 3, No. 4, pp. 262-275.

The Knowledge Organisation – Does it really exist?
<http://www.divinewrite.com/downloads/Knowledge_Organisation_Article.PDF> [2007-04-03]

The Shaping of the Modern World – Glossary.
<http://academic.brooklyn.cuny.edu/history/virtual/glossary.htm> [2007-03-26]

Trochim, W. M. K. (2006). Deduction & Induction – Deductive and Inductive Thinking.
<http://www.socialresearchmethods.net/kb/dedind.php> [2007-04-01]

Tuomi, I. (1999). Data is more than knowledge: Implications of the Reversed Knowledge Hierarchy for Knowledge Management and Organizational Memory. *Journal of Management Information Systems*, Vol. 16, No. 3, pp. 107-121.

Validity, from writing guides at Colorado State University
<http://writing.colostate.edu/guides/research/relval/pop2b.cfm> [2007-03-24]

Weick, K., Sutcliffe, K. & Obstfeld, D. (2005). Organizing and the process of sense making. *Organizational Science*. Vol. 16, No. 4, pp. 409–421.

Weinberger, D. (2007). Taxonomies and tags: from trees to piles of leaves
<http://www.hyperorg.com/blogger/misc/taxonomies_and_tags.html> [2007-04-03]

WikiWikiWeb: WikiDesignPrinciples
<http://c2.com/cgi/wiki?WikiDesignPrinciples> [2007-04-03]

Wikipedia: Controlled vocabulary
<http://en.wikipedia.org/wiki/Controlled_vocabulary> [2007-03-27]

Wikipedia: Semantic web
<http://en.wikipedia.org/wiki/Semantic_web> [2007-03-05]

Von Krogh, G. (1998). Care in knowledge creation. *California Management Review.* Vol. 40, No. 3, pp. 133-153.

Appendix 1 – Interview Questions Phase One

Questions about the recipient

How long have you worked at AstraZeneca?

What is your title?

In what department do you work?

What do you work with?

What is your knowledge area?

Questions about informational needs

What different tasks do you have related to the knowledge area (P*oorly solubles*.)?

What information do you handle in your everyday work related to your knowledge area?

What information sources do you need to use to solve your tasks (colleagues and information systems)?

How well do these sources help you acquiring the information you need?

What kinds of problems are related to information gathering and do you see it as a problem to fins necessary information?

Do you have an idea about what is needed to improve your possibilities to find the information and knowledge you need?

Is there any information and knowledge you consider valuable which is not available to you?

How do you feel about sharing your knowledge?

What kind of information do you find most suitable to share with your co-workers?

What kind of information would you like to get from your co-workers?

Appendix 2 – Interview Questions Phase Two

Method questions

General

What's your general opinion about the pilot?

Have your opinion of the pilot changed over time?

How would you position this wiki-solution in relation to existing information and knowledge solutions like the InfoSpace and eRoom?

Which are the main advantages with the wiki concept compared to other solutions?

Was the information you received at the introduction meeting enough to get started using the wiki? Was it something you missed?

Was our role important to get the wiki started and is the need for support something you think will change in the future?

What did you do when you encountered a problem?

Wiki usage

Was you expectations of the wiki concept comparable with the actual usage?

What's your experience with the graphical user interface?

Was the graphical user interface and the functions logical?

Was there something in the wiki usage which you experienced as troublesome or difficult?

Is there any functions which you missed?

What affected the amount of time and effort that you put into this wiki?

Has it been difficult to come up with suitable information to publish on the wiki?

Worktasks

What's your opinion of the tasks you received?

Is there a need for further training in wiki usage?

How do you think it's possible to make people contribute to a greater extent?

Organisation Culture

Do you feel that you have a common understanding of what's being communicated in the knowledge area that this wiki supports?

Do you trust the correctness of the information in the wiki?

Is it important that the information is correct?

What's your opinion of information that someone else has submitted? Does the contributor matter?

The wiki is a system where users can easily publish information, what's your thoughts about publishing information in the wiki?

Reasons not to contribute:
– Information is valuable and it makes me unique?
– Lack of time?
– Don't want to expose myself to the risk of being criticized by other wiki users?
– Insecurity of not knowing in which purposes the published information might be used to in the future?
– The published information might generate time-consuming questions?

Is it clear how you can contribute in the wiki in a valuable way?

Is it important that you are motivated to use the system to create a valuable result?
- What's the most important factor for you to use the system?

Have you noticed that the organisation encourages the value of sharing?
- Is it important that the organisation supports the value of sharing?

Has anyone above you in the organisational hierarchy expressed any opinions concerning this project and the concept of wiki?
- Has their opinions affected your view?

Content

How can the content of a wiki be made relevant?

Who or whom has defined the content of the wiki?

Can there be a conflict between information correctness and the dynamic nature of a wiki which is based on quick contributions of unstructured information?

Is there a need for a clear vision from the organisation about the purpose of the wiki?

Structure

What are your thoughts about the structure of the wiki?

How is the wiki usage affected by the growth of the wiki?

Do you think there is a need for a predefined structure in the wiki by the organisation? Or do you think the users can manage it by themselves?

Are there any implications whether the users or the organisation defines the structure?

Functions

Do you think the graphical user interface is of great importance in the usage of a system?

What's your opinion about the navigation in the wiki?

What's your opinion about the editing-mode? Have you tried Wiki Mark-up, and if - what's your opinion about it?

What's your thoughts about anonymity which prevents one from seeing who contributed information in the wiki?

Can you imagine any situation where you might need restrictions to pages?

Concluding question

What could we, the organisation and the users have done better?