Information sharing practices and the tools to support it: An interview study at ABB

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Information sharing practices and the tools to support it: An interview study at ABB

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1 Introduction
This thesis is the final part of my education in the Computer Science and Engineering program at Linköpings tekniska högskola. The thesis is conducted at ABB Corporate Research (CR) in autumn of 2007.

The purpose of this thesis is to investigate how information sharing in distributed development projects can be improved through the use of information sharing tools. Work published on this subject has been investigated and ABB employees whose work highly depends on information sharing have been interviewed.

1.1 Background
As the world economy becomes more global, development projects tend to be less bound to one geographic location. This fact changes the way development projects are carried out. It raises a lot of opportunities but also a lot of challenges. The most important reason for distributed development is proximity to markets and expertise. For example if you want to sell your products in China you have a far better chance of outperforming Chinese competitors if you are present in China employing Chinese people who have a good understanding of Chinese conditions. It also happens that there is a shortage of a particular competence in a company’s country of origin while that competence is available elsewhere. Other advantages with distributed development projects are that projects can be running 24 hours a day due to that time zones make people on opposite sides of the globe work at different hours. Another is that the cost of work is cheaper in one country than the other.

As stated above distributed development projects also create challenges. Collaboration is a lot easier when every member of a project team is sitting on the same floor. So is information sharing. Information sharing can make a huge difference when it comes to productivity and efficiency, especially in large corporations that have many projects going on at the same time. For example, two development projects can be going on at the same time where a portion of the projects are close to identical. With good information sharing this can be used to minimize double work and thereby increase productivity.

In a distributed development project you can’t just walk over to a colleague’s room and ask him about something. How do we make information available for every stakeholder and how do stakeholders know what kind of information they should share? How do we structure information in a way that is perceived as logical both for people who push information and people who pull information? Information technology made distributed development projects possible and information technology will help us overcome its challenges.

1.2 Problem Statement
As stated in the introduction, the purpose of this thesis is to investigate how information sharing is conducted at ABB and how it can be improved by the use of information sharing tools. Published work on the subject has been investigated and interviews have been carried out with ABB employees whose work is affected by information sharing practices.

The following questions will be answered by this thesis:
- What kind of information should be shared? I.e. what kind of information is found useful?
- What tools for structuring and sharing information are available and used?
• How do we make participants share required information on a regular basis and what incentives do they need in order to do so?
• How should information be structured to make it easily accessible for all stakeholders?
• How can information integrity be maintained?

1.3 Definitions and abbreviations
In this section I explain the following concepts. I chose these concepts because they are frequently mentioned in the text and there may be readers who are not familiar with them. A few of the concepts are information sharing systems that are used today. The concepts are listed in alphabetical order.

Push and pull
By pushing information I mean that the sender (which could be a person or a system) takes the initiative to send information to the receiver. By pulling information I mean that the receiver requests information and retrieves it from the sender.

RSS
RSS stands for Really Simple Syndication and it is a family of formats used to publish frequently updated content, for example newscasts. The purpose of RSS is to make it possible for people to automatically stay up to date with their favorite publications. The RSS content can be read by software called an RSS reader where one can prescribe to certain RSS-feeds and thereby have new content automatically delivered to you.

SAP
SAP is a German software manufacturer. SAP stands for Systeme, Anwendungen und Produkte in der Datenverarbeitung which means "Systems, Applications and Products in Data Processing". The product that is referred to as SAP in this text is called SAP Business Suite and is the most used family of business applications and it covers just about every information storage, planning and management need.

Serena
Serena is a company that manufactures software for application lifecycle management. Their product called Dimensions is a highly scalable platform for distributed development. Its power lies in the integration of Visualization, Requirements/Configuration Management, Build, Deploy and Reporting capabilities into a single software family.

TeamSystem
TeamSystem is a tool for storage and management of code. It provides configuration management and version management.

2 Method

2.1 Selection of theoretical background
I searched the databases Business Source Premier, IEEE and SpringerLink for any published work related to information sharing, information sharing tools and systems, distributed development and global development. I also made some searches about incentives related to information sharing. These searches gave a large number of results. I read the abstracts and conclusions of the first 30-50 search results of every search. What I was looking for was the organizational and managerial perspective of information sharing. It could be work from a
theoretical perspective but it could also be descriptions of how other companies solved problems of this nature or surveys about how people thought information sharing should be done. A large number of the search results described technical solutions and implementations of information sharing tools. This kind of information was not relevant for me. When it comes to published work about incentives to share information I looked for surveys or descriptions about examples from real companies.

2.2 Why ABB?

I believe that ABB is a suitable company for this thesis because of three reasons. The first one is that ABB is a multinational corporation that is represented in several countries on five continents. As a result of this most of the people I interviewed had experience from working in distributed projects with members from Sweden, Norway, Finland, Switzerland, the United States, Germany, China and India. This aided my research because it gave me access to interviewees with a broad perspective. Because of this my findings would not be limited only to the Swedish way of working. I believe this to be an important factor since information sharing habits tend to differ depending on culture. The second reason is that ABB is made out of several independent companies all working their own way. This makes it possible for me to get a diversified input in my research and not only acquiring information about one way of working during for example the development of the same products. During the interviews it became clear that the people from different ABB companies had different ideas about information sharing. This is the reason why the interview results, when regarding some of the questions, were so different from each other. The third reason is that ABB has a long experience of supervising thesis workers and I think that this would be beneficial for the quality of the project.

2.3 Empirical methodology

I chose to do interviews because observations was not possible under the given time-frame and amount of resources. If observations would have been made their scope would have been too narrow as a result of the limited time-frame. Therefore the results would not have been representative. When it comes to questionnaires, according to Robson (2002) questionnaires have low response-rates and there is a risk that misunderstandings go undetected.

The interviews I did were semi-structured as Robson (2002) defines it since I wanted them to be structured enough in order to make sure that all my questions got answered. However I did think it to be preferable if the respondents felt the freedom to express own reflections and opinions without being specifically asked. Most of the interviews were face-to-face since face-to-face is the most rich kind of communication (Robson, 2002). Five of the interviews were telephone interviews because four of the people were located in Finland and the fifth in Malmö, Sweden. Telephone interviews are not as rich as face-to-face since seeing the interviewee may give additional information (Robson, 2002). But Robson (2002) claims that telephone interviews do share some of the pros of face-to-face interviews such as high response rate and low risk of misunderstandings.

2.4 Selection of interviewees

Interviewees were selected in cooperation with my supervisors Stig Larsson and Clarens Jonsson. The main criterion for selection was that we wanted people from different parts of ABB to participate because different units have different needs when it comes to information sharing. The second criterion was that we wanted people who have different relations to projects. Some people were project leaders mainly concerned with pushing directives and
receiving progress reports while some people were standing outside of the projects evaluating the work-related processes of several projects. Some of the interviewees are working as developers without having a managerial position in the project. Many of the project leaders also had experience from being regular project members and therefore they could base their conclusions on both of the perspectives. However for some of them it was too long time ago and a lot has changed since then when it comes to information sharing which makes their past experience less relevant. Every person I interviewed had a different need of exchanging information and the people with whom they exchanged this information varied as well.

2.5 Method of presenting empirical findings
The reason for presenting the empirical findings as summaries sorted by topic is the following. The interviews were open-ended and qualitative which made it difficult to present any quantitative results. Furthermore the number of interviews was too small to be able to draw any statistically verified conclusions. Due to the number of different opinions I found it most appropriate to use summaries since it gets every relevant opinion included. I chose to sort it by subject instead of by interview because it gives the reader a better overview of the situation for every topic. Another reason for this choice of sorting is that sorting by who said what would not provide any additional relevant information since all data about each interviewee has been removed to ensure confidentiality.

3 Limitations
Even though ABB conduct projects all over the world only people from Sweden and Finland were interviewed. This could pose limitations to the information found about information sharing practices and especially the cultural factor is affected by this fact. Furthermore only people employed by ABB have been interviewed. That means no people from ABB:s contractors have been heard or any other people in some way associated with ABB.

When I examine different information sharing tools, I only consider their functionality and to what purpose they can be used. I do not mention anything about how they are implemented or how they actually work. This thesis is only about the goals these tools can help to achieve. Furthermore, my conclusions rely only upon the statements of the people I have interviewed and the papers I have read. My personal experience of these tools is very limited. Most of them I have never used and a few of them, including Lotus Notes, SharePoint and Lotus Sametime, I have used a few times.

Everything that is mentioned under the empirical data section is the opinion of the people I have interviewed. I have made no observations to make sure their statements were correct. I am not familiar with the different types of data that ABB use and therefore the only knowledge I have about the different types of data that are mentioned is what has been supplied by the interviewees.

4 Theoretical background
In this chapter I present the literature that I have studied during the thesis work. I start with literature about information sharing and global software development in general. After that I present the information sharing tools that are available and used today. The section is rounded up with a few published articles on employee motivation and incentives to share information.
4.1 Published work about information sharing

4.1.1 Information sharing needs of distributed development projects

One of the authors I specifically searched for was James D. Herbsleb. The reason for that is that one of my supervisors at ABB, Stig Larsson, claimed that Herbsleb was a respected researcher in information sharing related topics. This was also indicated by the fact that there were several articles on the topic written by Herbsleb but also because he was quoted by other researchers. According to Herbsleb and Moitra (2001) software has become an important part of every business. As result of that more and more companies started to experiment with having their software development units located in other parts of the world where the cost of labour was lower. The reasons for this besides the fact of lower costs was that some of the products were intended for the offshore markets and therefore increased proximity to the target market could be achieved. Another reason was that faster deliveries could be achieved by having different departments located in different time zones and thereby making it possible to work around the clock. Larger corporations saw the opportunity to capitalize on possible mergers and acquisitions and therefore ended up having units all over the globe. All this led to the fact that today software development is multisite, multicultural and globally distributed (Herbsleb & Moitra, 2001). The same authors claim that distributed development is more difficult to carry out and takes more time than collocated equivalents. They also claim that communication and coordination is vital for the success of distributed development. Also Sangeeta et al (2005) claims that sharing information and knowledge is more important when it comes to distributed development projects. However Herbsleb & Moitra (2001) claim that research has shown that conditions are similar if you are working on different floors as if you are working on different continents. This gives even more reasons to study distributed development. An efficient way to share information is also critical when it comes to synchronization of tasks for example between developing teams and test teams (Sangeeta et al, 2005).

Sangeeta et al (2005) point out that a large amount of knowledge is created during the life-cycle of a product, but that it is not effectively captured by organizations and shared to the next project. This is also confirmed by Herbsleb and Moitra (2001).

4.1.2 Types of communication

Software development requires lots of communication and there are two distinctive type of communication that both are important (Herbsleb and Moitra, 2001). The first is the more formal and official kind of communication which is mainly about updating project status, determining who has responsibility for what and exact definitions of the products to be developed. Here a good interface to share information is important, otherwise time may be lost and problems may not be dealt with. On the other hand there is this informal kind of communication, the kind of discussions that can arise from asking a colleague in the room next to yours about some simple issue. When this channel of communication is neglected, problems can arise abruptly and rework can be the consequence (Herbsleb and Moitra, 2001). The authors also claim that this communication channel gets more important when project uncertainty is high. Sangeeta et al (2005) make a similar distinction between what they call tacit knowledge and officially documented explicit knowledge. They claim that in distributed teams only the explicit knowledge gets shared which has a negative effect on the competitive advantage of the organization. The normal way of sharing tacit knowledge is through informal conversations in the hallway or during coffee breaks. This is the reason why sharing of tacit knowledge is rare in distributed development projects. “Thus, knowledge at the individual level of the team members needs to be institutionalized and localized at the organizational
level in the form of collective frames of references, systematized methods of work, and sophisticated routines and processes.” (Sangeeta et al, 2005, page 2). The authors are trying to say that somehow the knowledge of every individual needs to be transferred to the organisation and somehow made available to its members. Information sharing systems can be used to achieve this.

Westelius (2008) has written an article about how the Swedish Energy Agency could influence people’s use of energy. The purpose of his work was to describe how public energy counseling is organized and how more information about energy usage could reach the public. One of the topics discussed was whether a wiki would help to improve the public’s knowledge about energy usage.

Westelius (2008) cites Daft and Lengel (1986) who talks about the difference between uncertainty and equivocality. According to Daft and Lengel (1986) uncertainty is about finding the direct answer to a specific question while equivocality is about acquiring the knowledge required to reach clarity on a subject. It can be about finding the information necessary to be able to ask the right questions. According to Daft and Lengel (1986) the choice of communications media depends on whether one is dealing with uncertainty or equivocality. When dealing with uncertainty, a less rich medium such as email, is enough since no discussion is required, just a straight answer. However if one deals with equivocality it is important to be able to give feedback or ask additional questions. Because of that a richer media is needed such as telephone conversations or face-to-face meetings.

Another issue mentioned by Westelius (2008) is that the size of the group of people who are communicating needs to be limited to only include people with similar goals. This is necessary to obtain good conversations between participants. However he also mentioned that the breaking of borders and limitations could also promote new contacts between participants and by that improve communication.

4.1.3 Knowledge types

Sangeeta et al. (2005) claim that when it comes to software development, knowledge is a strategic resource. Sangeeta et al (2005) defines knowledge management as a flow of knowledge from people who possess knowledge to people who need it. Knowledge is supposed to grow and evolve during the process and organizations need to provide incentives to share knowledge. The same authors claim that there are five different types of knowledge that are relevant for distributed development projects. They are user requirements knowledge, functional domain knowledge, technical knowledge, project status knowledge and project experience knowledge.

Managing user requirements knowledge is critical because meeting the client’s requirements defines whether the project is successful or not. Another reason is that user requirements may have to change during the project and everybody needs to be aware of the changes. The authors claim that poor requirements specifications are the main reason for software project failures, late deliveries, over-budgeting, and poor performance. What sometimes happens is that even though requirements are thoroughly analysed, the knowledge is not captured by the entire project and thereby not every member is able to take advantage of it (Sangeeta et al, 2005).

No project member knows everything about the product that is to be developed and members know different things, but they learn more and more during the project. This knowledge needs
to be obtained, shared, and integrated so the team as a whole learns what it needs to be able to
develop the product (Sangeeta et al, 2005).

When it comes to project status knowledge, it is very important that all the members know
what is going on in the project. For example, if a problem or obstacle arises and is resolved, it
is preferred if everybody knows about it in order to have it resolved quickly if it happens
again in the future. (Sangeeta et al, 2005).

It happens quite often that specific knowledge which is gathered during one project will be
useful for future projects. Knowledge in the form of lessons learned, that is mistakes which
you have made in the past can be particularly useful to store in some sort of easily accessible
database so that mistakes aren’t repeated. It is also getting more and more important to store
application domain knowledge so that it can be used in upcoming projects (Sangeeta et al,
2005).

Sangeeta et al (2005) also found that there are three types of knowledge bases, namely project
documentation, best practices documentation and “issue bases”. With bases the authors mean
structured places for knowledge to be stored.

4.1.4 Shortcomings of today's information sharing practices
Komo-Sirviö and Tihinen (2005) conducted a survey about distributed development projects
which included answers from 27 different companies. 23 out of the 27 companies were
working on projects that were distributed over more than one country. There were participants
located in America, Europe, Australia and Asia.

When the companies were asked to identify the most common problem areas, 81 percent of
them named development tools and environment to be a problem area. Many of the problems
in this area were related to infrastructural problems such as unstable or too slow network
connections. One of the respondents mentioned that the development tools were based on the
assumption of very fast networks. One solution which actually reduced these problems was
when they changed the development strategy from synchronous to asynchronous by having
several local databases instead of one central one. The local databases got synchronized once
a day.

Another reason in this problem area was the fact that too many different tools were used to
share information and that these tools were incompatible with each other. Sometimes the
problem was only that different versions of the same tool were used. Most of the respondents
seemed to be aware of how critical it was with a compatible environment but most of them
were reluctant to change tools.

Cultural differences were mentioned as a problem area. The problems arose through
insufficient language skills and misinterpretations as a result of different ways of speaking.
The respondents also mentioned that the way people deal with problems and whether they
report them or not is affected by culture. Also their tendency to share information is affected
by culture. Several of the respondents mentioned that face-to-face meetings reduced the
problems related to culture because people tended to understand each other better when they
occasionally met face-to-face. Herbsleb, Paulish and Bass (2005) wrote about experiences
from distributed development at Siemens Corporation. They claim that cultural differences do
make communication more difficult especially when it comes to how people from different
countries report problems. How quickly people respond to emails is another thing that differs
in different cultures. Several of their interviews showed that face-to-face communication lead
to cultural differences having less negative impact on communication. It is also important
when it comes to building relationships and trust.

Grundy (2000) describes component-based software engineering. In his paper he discusses
different tools for component-based software engineering. Among those, he talks about
systems where one tool includes a wide range of functionality. However, he does state that it
is very difficult to decide the scope of a system, namely which functions that should be
included or not. If the system becomes too large and contains too much functionality it runs
the risk of getting difficult to use and maintain. On the other hand if it is too small it can’t
include all the necessary functions and it gets necessary to have more than one system. This
also complicates it for the user.

4.1.5 Preferred functionality of information sharing tools

Babar, Kitchenham, and Jeffrey (2006) made a study about scenario-based methods for
evaluating software architecture. Software architecture evaluations usually involve a large
number of different stakeholders and to have them all collocated is both costly and
problematic. The study they made compared two different ways of conducting software
architecture evaluations. One way was to hold traditional face-to-face meetings and the other
was to hold a distributed meeting through a groupware system. The findings were that the
majority of the people did claim that they thought that face-to-face meetings would be more
efficient and lead to better results. However the actual results showed the opposite and as a
matter of fact the groupware solution lead to better results than the face-to-face.

Wagner (2004) addresses the usage of knowledge management tools from two different
perspectives, the perspective of the user who wants to obtain knowledge and the perspective
of the user who shares knowledge.

From the perspective of the knowledge user who requires ad-hoc knowledge, it is important
that the knowledge management tool can satisfy their knowledge management needs just-in-
time. The reason for this is that they normally cannot specify their knowledge needs in
advance. Wagner (2004) also claims that a knowledge management tool needs to be search
friendly. With search friendly he doesn’t only mean that you can do keyword searches but
also advanced hyperlink searches and popularity searches, just like in Google. It is also an
advantage if relevance can be defined so that knowledge can be filtered from noise. Another
aspect that is important for the knowledge user is that quality can be confirmed. A knowledge
management tool can assure this by including functionality for tracking the source of any
piece of information.

From the perspective of the knowledge creator, Wagner (2004) mentions the following
criteria. It is important that the system supports quick distributions of fast changing
knowledge to as many users as necessary. The system should also be able to combine the
knowledge of many users and present it in a structured way since no individual possesses
every piece of information and the collective knowledge usually exceeds the knowledge of the
individual. Another beneficial function is if the system is self-correcting, that is that
management does not need to actively supervise the contents. According to Wagner (2004)
this is the way knowledge creators prefer to assure quality of information.
4.2 Existing information sharing tools
This section presents the information sharing tools that are available and used today. Advantages and disadvantages with every tool or way of sharing information will be presented.

4.2.1 Conversational technologies
Conversational information sharing technologies help people communicate directly with each other. The advantage with conversational technologies is that answers to specific questions can be received quickly. The disadvantage is that there is no guarantee to if and when the other party will reply.

Wagner (2004) writes that conversational technologies are best suited for information sharing when the information is ad-hoc and the source is distributed. With ad-hoc he means that it is about new knowledge, knowledge only used for this specific project. He mentions a few conversational technologies such as e-mail, static and database-backed web pages, discussion forums, instant messaging/chat, video/audio streaming and conferences, weblogs and wikis.

Email
Wagner (2004) defines email as an asynchronus one-to-one or one-to-many conversational technology. Unless the email-server is very sophisticated email is not supervised. Email is most broadly used IT based communication technology.

Instant messaging
Instant messaging is a synchronous one-to-one, one-to-many and many-to-many communication where participants chat live with each other (Wagner, 2004). There are several instant messaging services available online such as AOL and MSN Messenger. Herbsleb, Paulish and Bass (2005) said in their paper about distributed development at Siemens Corporation that instant messaging is useful and have properties that are different from email, especially the fact that communication gets easier and faster. Communicating through instant messaging is more informal than through email and because of that people don’t need as good reasons for taking contact through instant messaging. Delivery is instant (if the other party is online) as opposed to email where it can take several days until the other party checks his or her emails.

Video and audio streaming
Wagner (2004) says that audio and video streaming started off as a popular technology to communicate one-to-many. They also had the advantage of not being affected by different time zones since they do not have to be synchronous. However audio and video recordings are not searchable, that is you cannot search for any specific contents in the video or audio streams. They also require very much storage capacity and take large amounts of time to view or listen to.

Video and audio conferencing
According to Wagner (2004) video and audio conferencing is a popular one-to-one and one-to-many way of communication. Results can be recorded but they are not searchable, and they require large infrastructure capacity both when it comes to transfer speed and storage capability.
4.2.2 Information repositories

Information repositories are places where information can be found. An information repository can be a supervised database where only chosen data gets added or a wiki where all the users have the right to add data. A discussion forum is something in-between conversational technologies and information repositories since people do ask specific questions but the questions are not sent exclusively to one specific receiver and the conversations are visible to every user.

Static and database-backed web-pages

Web pages can be viewed as a one-to-many conversational technology but because of the variety of web-pages you can also view them as many-to-many (Wagner, 2004). Since many web-pages are interactive and users can post comments on them you sometimes have communication in both directions. However the main purpose is to make information available.

Discussion forums

Discussion forums are the key way of communication and knowledge-exchange for many online communities (Wagner, 2004). They are a many-to-many communication technology where users can discuss different topics in a structured manner (Wagner, 2004).

Weblogs

A weblog is a chronological recording on a webpage which could be either static or database-backed (Wagner, 2004). Weblogs are usually managed by blogging software.

Wikis

A wiki is a set of linked web pages that can be edited online in the web browser by the users (Wagner, 2004). He also claims that the most useful conversational technologies are the ones that are easy to search and are easily managed by end-users. Wikis fulfil both of these criteria by having its entire structure defined by searchability and by the fact that the end-users are the only providers of its contents. Contents in a wiki are not reviewed prior to publication by any editor or coordinator because when a page has been edited it is instantly published automatically. Also new pages are created on the fly by users when they choose to do so. Wikis are easy to search because pages are linked together based on relevance. There is no menu structure, instead you search and then browse other related topics from your search results.

According to Wagner (2004) and Cheung et al. (2004) wikis should be the most effective conversational tool when it comes to solving ad-hoc problems when the users are distributed.

Westelius (2008), who examined whether a wiki could be used by the Swedish energy authority, claims that a wiki could help people to find the right thread of discussion to be able to ask the right questions in order to reduce equivocality. He also said that a few responsible people would be needed to keep the wiki alive and up to date and that these people could be employed by the Energy authority. People would also need to be hired to make sure that the wiki starts with a decent knowledge base. Otherwise there would be no point for people to consult it.
4.3 Published work about motivation and incentives to share information

Hsu (2006) made a study about employee motivation to share information. Nine companies from Taiwan participated in the study. He claims that employee motivation is essential for knowledge sharing but that it in general is not well understood.

According to Hsu (2006) there are three approaches to make employees share more information. One is tool-based with IT-systems playing a central role in facilitating and thereby encouraging information sharing. The second is incentive-based where incentives from management are meant to make employees share knowledge. The third approach is integrative where factors such as management values, organisational structure, culture and processes are made to facilitate knowledge management.

In Hsu’s study he found that the companies which had the best information sharing results gave special incentives to employees to share information and they clearly linked their information sharing ambitions to their company goals. The incentives were seldom monetary and if they were they were just symbolic, less than USD 50. The rewards instead were official recognition, for example one company held a competition where they named someone “idea champion” in different subjects. The high performing companies also had a wide range of channels where employees could share information, most of them IT-based. In fact all of the high-performing companies had an e-learning system or a knowledge storage system in place. Some of the high performing companies had discussion forums where employees could share ideas and others had online technical knowledge catalogues where employees could look for technical information. The high performance companies in Hsu’s study had sophisticated performance evaluation systems where people were evaluated from different aspects and had predefined performance-objectives. This way the employees felt impelled to continuously acquire new knowledge in order to pass the performance evaluations. Another thing that distinguished the high performing companies from the low performing ones was the fact that the CEOs of the high-performing companies strongly supported the information sharing practices and they were themselves involved in them.

Wasko and Faraj (2000) conducted a survey where they examined three electronic communities. The purpose of their work was to find out why members of electronic communities are more willing to share knowledge than employees of organisations. The authors argue that the reason for this is that organizations with commercial purposes treat knowledge as private goods while communities treat it as public goods. When knowledge is treated as private goods which are bought and sold on a knowledge market people only share knowledge in order to receive the rewards associated with knowledge sharing. According to the authors this is what happens when employees are given monetary incentives to share knowledge. They even go as far as to saying that knowledge markets promote hoarding behaviour and internal competition which clearly diminishes the free flow of knowledge within the organization. However when knowledge is treated as a public good people share it because they feel that they want to contribute and that sharing knowledge is the right thing to do instead of the expectation of return. The most economic and rational thing to do would be to free-ride and only use the community to extract information but the fact that communities work and that members are continuously contributing proves that the motivation to share is not pure self-interest.

If knowledge is viewed as a public good and is supposed to be embedded in a community, information sharing tools should support information exchange between members and public
discussions where several members can participate. Existing technologies with these characteristics would be electronic discussion groups, bulletin boards and chat facilities. The authors also point out the size of a community as a critical factor. If the group becomes too large and too much information becomes available than it is difficult to sort out relevant information. This leads to the members being less interested in participating because the community loses its purpose when information is no longer as easily available. The authors also mention that participation in communities can be time consuming and that slack time may be necessary for people to actively participate, especially when it comes to experts who are always very busy.

The actual survey they conducted showed that the most cited reason for participating in the community was to give back to the community for received help. People also mentioned that the possibility to post questions and receive feedback is more valuable than to only find raw information. There were participants who mentioned tangible returns such as useful information, expertise and answer to questions. There were others who mentioned intangible returns such as self-satisfaction and the feeling of doing the right thing. One person also mentioned that sharing knowledge is a great experience since if you can teach something then you truly understand it.

Gaved, Heath, and Eisenstadt (2006) wrote a paper about wikis of locality. The main purpose of wikis of locality is to facilitate communication between people living in a specific geographical area and to provide useful information about the area in question. The Open Guides is a network of online communities focused on specific geographical areas. The software used is wiki-based and each entry has one or more administrators who attend to its maintenance.

The authors made a survey about The Open Guides where one of the goals was to find out what drove the administrators. The survey showed that “dedication” from the administrators and a small number of authors was the single most important factor to ensure that the Open Guide is kept alive. Most respondents noted that sustainability will need to be addressed as an issue in the future because the open guide at this moment only was updated by the administrators and a small number of key contributors. The survey also showed that the most appreciated features of these wikis were the two facts that it was free and that anyone could edit it. Since people could edit the contents freely material was reused in ways the founders had never considered. The authors concluded that a so called “critical mass” needs to be achieved in order to make the open guides self-sustaining. In that way the guides will have enough users to encourage further contributions and enough contributions to encourage further usage.

An interesting point made by the authors is that wikis of locality actually encouraged face to face interactions as a result from interactions in the wiki.

5 Empirical data

5.1 Interview conclusions

In this section I summarize the data I have received during the interviews. The data is going to be sorted by topic. For every topic I present the different opinions I received from the interview subjects and I also point dominant opinions. The original summaries from every interview can be found under chapter 9.
5.1.1 Current situation

A clear majority of the people I interviewed are not satisfied with the way information sharing is conducted today. Only one of the interview subjects explicitly stated that information sharing is working satisfactory. According to a majority of the interviewees the biggest problems lies in the fact that information is not easy to find and that it is not supplied in a regular manner so you never know if the data you have found is the most recent or not.

Even though there are several tools being used the most common and trusted ways of communication are besides face-to-face meetings either email or telephone. In some occasions Skype or some other Voice over IP technology can be used instead of telephone but the effect is the same. Several of the people I interviewed said that if you want information that you can trust you need to directly ask the person who knows. You can not count on finding the specific information you need in one of the information sharing tools that are used. Some people also mentioned weekly meetings (face-to-face or over the phone) as a way to share information on a regular basis. One person said that he receives documents on a weekly basis and that this way was working fine for him.

Today the most used tool for information sharing at ABB is Lotus Notes. Besides functionality for booking appointments, calendars and email Lotus Notes provides database functionality for information sharing. This functionality is frequently used at ABB. However the majority of the people who use it are not satisfied with it. Several interviewees said that searching for information in the Lotus Notes database seldom leads to you finding what you searched for unless you know the exact location of your data. The general opinion is that data is not structured in a logical manner and that this is the reason for the bad searchability. There are directives for how to structure information and where to put data but people interpret them differently which leads to an unstructured storage of information. One person also mentioned that people are not updating documents they have uploaded. The consequence is that when you find a document, you never know whether it is up to date or not unless you contact the author. According to the same person, the Lotus Notes database is more useful for historical information where it is not as critical whether data is up to date or not. Another issue which was mentioned a few times is the way you add data or edit data. You can make posts and upload documents. An uploaded document needs to be reviewed and approved by someone else. This causes a delay. If you wish to change a document you have to download it, edit it and then upload it again. Several of the interviewees have said that this is not a smooth way to change uploaded documents and that they would prefer to edit it online.

As an alternative to talking on the phone, about half of the people I spoke to mentioned a tool called Lotus SameTime. It is an instant messaging system which means that people can send messages to other users who are online. The message is instantly delivered and that way people can communicate live. However one of the interviewees said that the disadvantage is that no information is stored permanently and that the information only reaches the people who are having the conversation.

The above mentioned tools, Lotus Notes and Lotus SameTime are the tools that were the most mentioned. However there are several other tools in use at ABB. There is a tool called Serena Dimensions which is used as common repository for code. It is also used to store some documentation, change management and bug reports. Serena Dimensions was mentioned by four out of the twelve people I interviewed. There is a number of tools which were only mentioned by one or two people. One of these tools is SAP which the people who mentioned it used it for either time reporting or to archive design and product data. SAP is said to have a
lousy user interface which makes it complicated to use. According to some of the interviewees SAP's interface is not intuitive and it takes a considerable amount of time to learn how to use it. Another tool is TeamSystem which is used for software related information. A third one is called Documentum and is used for sharing documents. Some of the projects use their own tools for sharing information. For example, one of the project leaders I interviewed said that a project he was leading used several open source tools. They were wikis, blogs and project portals. An R&D and product information management tool was mentioned in one of the interviews but no details were discussed. One interviewee also mentioned a tool called Serena RM which is used for requirements management.

The general opinion is that there are way too many tools in use and the more people I interviewed the more different ways of sharing information I discovered. Besides Lotus Notes and Lotus SameTime there is not a common way to share information, every department or project does it their own way. As several of the interviewees have mentioned, this makes it very difficult to find specific information. Another consequence of this is that communication inside specific projects is working very well since they develop their own routines. However if a stakeholder from the outside wishes to take part of the information it gets a lot more difficult and as one of the interviewees mentioned, the only way to get answers is to contact people and ask them.

5.1.2 Information types to be shared

One person out of the twelve I interviewed said that all types of information should be shared by an information sharing tool. The type of information which most of the interviewees wanted to share is official documents such as project plans, requirements specifications, time plans, test-reports, etc. Process descriptions and general information about the way people are supposed to work is also requested. It seems that not even the official documents are spread to everyone in an efficient way. As an example of how badly people are informed, one project leader said that there are members of his projects who do not know that he is the project leader.

Besides official documentation, technical information is requested. One of the people I spoke to said that an engineer does not want to know organizational information, he wants to know how his piece fits the puzzle. Technical information can be description of components for example.

Another type of technical information which was mentioned several times is information about changes. It is very important that people are told about changes because they might affect their work. One person said there is a need for an automated tool for change reporting so people don’t have to ask each other if any changes have been made.

The last category of information that was spoken about is “the kind of information you ask people about today”. This could be anything from specific technical solutions to recent changes or results from minor tests.

5.1.3 Incentives to share information

A clear majority of the people I interviewed believes that specific incentives are needed to make people share information on a regular basis. The two most common opinions is to make people realize that information sharing is useful and to have management make information sharing an official part of work and somehow rewarding people or give them better evaluations when they fulfill goals related to information sharing.
Seven of twelve the interviewees claimed that if people realized that sharing information does make a significant difference, they would share information. One way to realize it is to extract information from system. Basically the challenge is to get the system running so that people can start extracting information from it because then they will feel more motivated to contribute. One suggestion is to have a group of people have as a specific task to just fill the system with information so the rest of the work force can start extracting information. It was also mentioned that there should be a person responsible for information sharing. His task would be constantly provide demand for information sharing.

About half of the people I spoke to said that it would help if management made information sharing an official part of every project. It was also mentioned that people have too little time in general and that this would need to be adjusted in order to make it possible for them to make information sharing a regular part of their job. A few of the people mentioned that information sharing performance should be included in productivity evaluations and one person said that specific rewards for information sharing would be a good idea.

Two of the interviewees suggested that the information sharing system should be the normal workplace and normal place to store data. This way data would automatically end up in the system and no extra information sharing efforts would be needed. One person did however say that he did not believe that it would be possible to make people share information automatically. The same person also said that it would be enough if people shared information when someone asked them to do so, they would not have to do it automatically.

5.1.4 Information integrity

The majority of the people I interviewed were in agreement about how information integrity should be managed. Basically there is a clear demand for the possibility to have certain types of information to be forced to undergo a formal review process before being published. This concerns most kinds of official documents such as project plans, test-reports etc. People seem to appreciate the functionality of the Lotus Notes database, where a document can have the status of Draft (not reviewed by anyone yet), Checked (somebody has checked the document), and Approved (document formally approved). Hence this functionality should be available in any new system for information sharing.

There is also a clearly defined demand for different user accounts with different access rights. The reason for this is that everybody is not supposed to see every piece of information and that if everything you do can be traced you are less likely to post invalid data or do anything else which is not preferred. However the risk is that the people prefer using the phone or instant messaging to avoid being monitored. It is up to the team who designs the system and its usage to find a fair trade off between traceability and anonymity.

When it comes to more informal kinds of information and information where the content does not have a huge impact on the way large groups of people work, the general opinion is that people should be allowed to freely post and edit it. The reason for this is that people prioritize that the handling of information is as fast and efficient as possible and that posting information is as easy as possible. None of the interview subjects is worried that this would lead to any severe risks to information integrity.
5.1.5 Preferred functionality of information sharing tools

The most frequently mentioned functions are information structuring and filtering, searchability and that the system is easy to use. Different access levels are also wanted and there should be a way to define different user groups in order to make sure that every user gets the right data. People could be placed in groups based on which company they work for, which projects they are part of and their roles in each project. The interviewees also said that something needs to be done to keep data up to date and it would also be beneficial if one could edit documents online in the system. There is also a need for functionality to keep data up to date or at least distinguish still valid data from outdated data.

A majority of the interviewees mentioned usability and searchability as the most important functions. Several of the interviewees said that it is crucial that usage of an information sharing system is intuitive and not complicated to learn. The main purpose of sharing information is to be able to find what you are looking for. Every single person I spoke to mentioned in one way or the other that searching for and finding information in a not too time-consuming manner is highly important.

Another frequently mentioned aspect was information filtering. Most of the interview subjects said that the information sharing tools used today contain lots of information but that far from all of the information is relevant for every user. That is the reason why information filtering is so important. Two of the interviewees mentioned that one solution could be to define different groups of users based on roles where every group had a limited set of information presented to them. If someone then wants to push information only to a specific group of people it could be easily achieved. Another solution to this problem that two of the interviewees mentioned was to use something similar to RSS-feeds where you can subscribe to certain sets of information and have them pushed to you.

As mentioned by one of the interviewees, the role perspective is also important to have a clear view of who is using the system and for what purposes. This increases the chance that the information sharing system actually meets the needs of its users.

In one of the interviews we discussed the fact that there are lots of information in the existing systems that is out of date. During the discussion the interviewee proposed a solution where the system would notify the person who has pushed information after a certain amount of time and ask him to confirm that the information is still valid or supply an updated version. Two more persons said that they thought this solution would be good. One person also talked about having an automated change reporting tool that would force people to report smaller changes on a more regular basis.

When it comes to storing documents, several of the interviewees said that they would appreciate a way to edit documents online in the system as opposed to Lotus Notes where you store the document files and in order to edit them you need to first download them, edit them and then upload them. One person also proposed that if you want all the new information to automatically end up in the information sharing system, then people need to do their work in the system. For example if the system would be linked with the word processor in use, then documents could be created in the system from the beginning and then you wouldn’t have to worry about whether people share their documents or not. However it would require further investigation to make sure that people are comfortable with this way of working. You would not want to make people feel monitored and thereby reluctant to come up with creative solutions.
A clear majority of the people I talked to said that different user rights is a necessity. Only some users should have access to upload and edit certain kinds of data. They also said that there is a need to have a document validating procedure where some newly uploaded documents only gets available after some person in charge has reviewed and approved them.

The size of one system is a subject that was mentioned in several interviews. The people who mentioned this aspect, thought that there were too many systems used at the moment and that this reduced information accessibility. However, people are also sceptical to too big systems. One of the interviewees said that to have one system meet all the information sharing needs is close to impossible unless you make the system modular and that way it would be similar to a multi-system approach. What seems to be a standpoint supported by several of the interviewed is to have a few systems which are linked and have a common user interface from where you have access to all of the systems. One of the interviewees also pointed out that a common user interface should definitely be web based so you can access it from any computer.

5.1.6 Wikis

A clear majority of the people I interviewed said that they consider using a wiki based system for information sharing a good idea. However I did not see any excess enthusiasm surrounding this particular solution and the need for change could have been the reason for people being so positive. Some of the interview subjects also added that the use of a wiki based system would not by itself solve the problems regarding information sharing. The problems with people not sharing information in time or not sharing information at all would still be there and the huge amount of information out there which makes it difficult to search would neither be solved automatically. But people do seem to think that using a wiki system would facilitate the struggle with these kinds of problems.

Most of the interviewees did say that a wiki system at ABB would need to differ from Wikipedia when it comes to user access rights and review processes. First of all users need to have a unique user account since people tend to be more careful and accurate when they know that their actions can be traced. Secondly, different people need to have different user rights. Some people are allowed to see some kinds of information and others are not. The same applies to editing information.

Several people said there is a need to have documents formally reviewed as in the Lotus Notes database. They claim that this procedure is needed for official documents. This is tied together with the functionality for user access rights since it would be necessary that only some people had the right to check or approve documents. Some of the interviewees think that for more informal type of information and every day information it would be beneficial to use a wiki system since adding information would be quick and easy. For these kinds of information a review process is not needed. One person also said that it would be an advantage if everybody could alter the process maps that management is spreading. He claimed that this would reduce the gap between how management thinks that people work and how people actually work.

One of the interview subjects mentioned that some data needs to be version handled (for example code). If that kind of information is to be spread through a wiki then version handling functionality would need to be implemented. The person who brought it up said that he doubts that it would be worth the effort to implement this functionality and that it is
therefore more beneficial to stick to the systems they use today when it comes to version handling.

The main concern when it comes to wikis self-correcting ability is how frequently it is used. One of the interviewees said that 80 percent of the users need to be active in order to make sure that the wiki is self-correcting.

6 Analysis and discussion

The interviews showed that the main problem with the information sharing practices at ABB is the lack of an established standard environment for sharing information and the lack of routines to do so. I believe that the reason for this is that ABB consists of a large set of independent companies where every company has its own routines and procedures. I also think that because of the diverse set of products that are produced at the different companies it would be really difficult to have one information sharing system to be used by all of them. This has been confirmed by the interviews. However the number of tools in use could be limited to a few by introducing larger tools that can handle more types of data. As claimed by Grundy (2000), this is easier said than done. These tools could be accessed from a main entry point just like Lotus Notes is used by the majority of ABB for email, calendar and database functionality. The reason for calling this the main problem is that a clear majority of the interviewees mentioned this problem as both the reason for why they don’t share information and why they contact people instead of looking in one of the information sharing systems. In my opinion the large number of information sharing tools makes the employees feel that if they look in one of the tools, they won’t find anything. That is along with lack of time also the explanation why they don’t share information on a regular basis.

In my opinion it would be appropriate to do something about the information sharing infrastructure at ABB. First of all, it is a fact that ABB will continue employing distributed development because of the global nature of their business. However, this does not have to be a disadvantage when it comes to information sharing and communication. In fact, Babar, Kitchenham, and Jeffrey (2006) found that distributed groupware meetings did produce better results than face-to-face meetings. Cultural differences always arise when your work with teams located all over the world and people from different cultures tend to behave differently from an information sharing perspective. According to Komo-Sirviö and Tihinen (2005) different cultures take different amounts of time to answer emails, a fact that affects how emails can be used throughout the entire organization. Furthermore, both Komo-Sirviö and Tihinen (2005) and Herbsleb, Paulish, and Bass (2005) have claimed that cultural differences have an effect on which problems that get reported. They also claimed that occasional face-to-face meetings lead to a greater understanding of each other among the different cultures which reduced the problems resulting from cultural differences. I believe that this is something worth considering at ABB as well.

Another issue that should be considered is whether it would be appropriate at all to have a centralized information sharing system at ABB. In my opinion it is very important that the organization of the information sharing system matches the organization of the company that uses it. Now ABB has for a long time been known for their decentralized ideal. Because of this I think that it needs to be further investigated whether a centralized tool is wanted at all. According to Grundy (2000) a large tool is very difficult to maintain. I am prepared to agree when it comes to ABB, especially when you consider that different ABB companies have differing organisational structures and work in different ways. However, one should also consider from an organizational perspective whether the decentralized ideal still is as certain
as it was 10 or 20 years ago. The interviews showed me that there is a lot of information exchange going on between the different ABB companies. This would instead warrant a centralized tool.

Both Sangeeta et al. (2005) and Herbsleb & Moitra (2001) claim that it is a common problem that knowledge created during the life cycle of a product is not stored. This seems to be the issue at ABB as well and lots of information is exchanged through mediums that do not store information. It would be beneficial if portions of the information that is shared by telephone, e-mail and instant messaging could instead be shared by an information sharing tool. This agrees with the statement by Sangeeta et al. (2005) about that individual knowledge must be transferred to the organisation. Time would be saved because the same piece of information could be reused several times and it would also make e-mail communication more efficient since people could take emails more seriously if the amount of received emails would be reduced. My conclusion is that this would only work if there are well-known routines for how information should be structured. Otherwise people would still prefer to directly ask someone through phone or email instead of spending time trying to look for a piece of information that you don’t even know if it is there or not. I think that this would be most suited for the knowledge types that Sangeeta et al. (2005) referred to as technical knowledge, functional domain knowledge and project experience knowledge. Westelius (2008) claimed that people prefer direct communication with the possibility of instant feedback when you communicate to reduce equivocality rather than to solve uncertainty. I think that this is the case at ABB as well and that this fact is hard to change. One should rather focus on trying to capture as much of this information as possible by for example having people sharing their conclusions after they have communicated directly. I also think that improved search capabilities of information repositories reduce the number of direct enquiries. This is a feature that according Wagner (2004) is highly prioritized by users who want to obtain knowledge from an information sharing system.

If and when an information sharing tool is developed, the data types used in the implementation should be chosen in a way that makes data searchable. For example, image and video data should be avoided because as Wagner (2004) stated, they are impossible to search. If it for some reason is necessary to store images, video, and other kinds of data of data that cannot be searched they should be stored together with detailed descriptions so that one can search the descriptions. Due to the large amount of data that is exchanged at ABB, undescribed images, videos, and similar data would only be available to people working close to the creator of them. That would make it pointless to store them in a central information sharing system.

In my opinion, instant messaging tools such as Lotus Sametime can be complementary to large information sharing tools. They also facilitate spontaneous exchange of knowledge with the possibility of instant feedback which helps people reduce equivocality just like Westelius (2008) claimed. Instant messaging is also the type of communication that was mentioned by Wasko and Faraj (2000) as appropriate in communities where a free flow of information is preferred. A drawback of instant messaging is that the information is not stored. It is in the best interest of the company that as much information as possible is shared through the main information sharing system because the information stored there can be accessed by many people and will remain in the organisation and thus become a strategic resource as Sangeeta et al. (2005) claimed. However I do believe that instant messaging tools lead to more frequent communication between co-workers because it is easier and you feel that you need less of a
reason to take contact via instant messaging than to write an email or make a phone call. This is in line with the statements made by Herbsleb, Paulish and Bass (2005).

When it comes to motivating co-workers to share information I think that information sharing should be an official task which should be part of time plans and integrated in their day to day work. This is in line with the integrative approach that Hsu (2006) presented where information sharing is integrated in most layers of the organisation. Even if making it an official task would have the effect that people would share information on a more regular basis it would be preferred if they felt an intrinsic motivation to do so. I believe that the only way to make people feel this intrinsic motivation is to make them realize that information sharing does make a difference and thereby have them feel that when they share information they do it for the greater good. This is what Wasko and Faraj (2000) found in their survey about communities. The interviews showed that if people see how they personally benefit from information sharing they will realize that others will benefit as well and thereby become motivated. There is a risk that only a few key contributors will actively provide information and that would jeopardize long time sustainability. This was one of the findings of Gaved, Heath, and Eisenstadt (2006). Just as the same authors claimed, the big dilemma with only a few contributors providing information is that it becomes difficult to achieve a critical mass large enough to motivate people to use the system. This issue could be solved as Westelius (2008) suggested with a few people being hired to manage the information sharing system and to provide with necessary amounts of information to get it going. Another way to motivate people to share information would be to reward them for doing so. Both Wasko and Faraj (2000) and Hsu (2006) were sceptical towards monetary incentives to share information. Hsu (2006) found that the high performing companies in his survey only used symbolic monetary incentives of less than USD 50. The incentives frequently employed by these companies were public recognition. One of them even had an official price where a co-worker was named idea champion. Wasko and Faraj (2000) claim that information sharing works better in online communities with no commercial goals than in commercial corporations. His main argument is that the problem in commercial corporations is that they threat information as a private good which is bought and sold on a market. My opinion is that the high performing companies in Hsu’s study, even though they manage to make people share information regularly, still treat information as a private good and with the well established infrastructure and organisational measures to share information they only enhance and facilitate the market where information is bought and sold. Now when it comes to ABB, the interviews showed that the strongest incentive to share information is that you have yourself benefitted from other co workers sharing information and because you know your shared information will be useful for others. This goes in line Wasko and Faraj’s view of information being seen as a public good. However, since Wasko and Faraj’s view have not been implemented in a commercial situation I would recommend ABB to go for a mix of Wasko and Faraj’s and Hsu’s recommendation. Since there already seems to be an opinion within ABB that information is a public good I would be careful with incentives because they could alter that view. According to Wasko and Faraj (2000) this could be counterproductive and also Hsu (2006) mentioned that monetary rewards make no difference. Instead I would focus on the infrastructure and organisational integration that Hsu (2006) referred to because it has been tested in commercial corporations.

My conclusion from the interviews and my own common sense tells me that adding data to an information sharing tool on a regular basis results in an extra workload. This is also confirmed by Wasko and Faraj (2000). My recommendation is that this subject gets investigated before any new information sharing practices are introduced. I think that it is of the outmost
importance that it does not add considerable extra workload in order for people to do it in a proper manner. My impression from the interviews was that people already are overloaded which leads me to the conclusion that any solution that increases their net workload would not be welcome. However if the new information sharing practice would improve efficiency and productivity it wouldn’t add an extra net workload. So the first thing that needs to be known is how much extra time these practices would require. And if it adds extra net workload on an individual level that needs to be compensated to ensure that it doesn’t result in an increased workload for some individuals. It is difficult to say how much extra time these new practices would require without knowing how everybody works. How much extra time people need depends on how often they make significant findings or changes that are useful for others to know. And how often you produce something like that depends on what you do. Adding extra time adds extra costs; therefore it would be necessary to make a budget for the whole information sharing transition. How much would the extra time cost? How much would it cost to plan and implement the new information sharing system? And how much can be gained from the improved information sharing practices? Would it only lead to increased productivity in less worked hours per unit or would the improved collaboration between individuals lead to more and better innovations? It was mentioned in the interviews that working on different floors make face to face interactions more difficult. Gaved, Heath, and Eisenstadt (2006) claimed that the wikis of locality that they examined actually lead to more face to face interactions between the people active on the site. If this happened at ABB as well, even in such a modest way that it only affected people working in the same building, collaboration would really improve. How much would that increase revenue? Is it even possible to model that? These questions are central to whether the project should be carried out or not and a serious effort needs to be made to answer them.

I believe that the role perspective is central both when it comes to optimizing information sharing routines and designing information sharing systems. I noticed a difference between the information sharing needs of developers and project leaders or supervisors. The developers usually requested information to solve a specific problem or to gather information about a specific component, the type of information that Sangeeta et al (2005) referred to as explicit knowledge. Daft and Lengel (1986) called this type of communication reduction of uncertainty and he claimed that this would require a less rich medium and that was what the developers among the interviewees highlighted. What they did not bring up, in my opinion because it is less obvious, is the kind of communication that could arise from an information sharing system. This communication could help to reduce what Daft and Lengel (1986) called equivocality and thereby answer questions before they are even asked. When a richer communications medium is required such communication could arise from the information sharing system just as in the case that Gaved, Heath, and Eisenstadt (2006) mentioned where face to face meetings took place as a result of the communication in the wiki of locality. A person in a more managerial or supervisory role is in need of what Sangeeta et al (2005) called project status knowledge. They need to know whether time plans are held and whether resources are properly allocated. They are the people who need to know if different projects have developed parts or gathered knowledge that could be exchanged. The kind of information differs and also the way these people want to find the information and how they wish to have it presented differ. This is something that needs to be thoroughly investigated before any routines are defined or any tools are developed.

Another important issue is who decides who gets to see or edit different types of information. This could either be done by having all data types pre-defined with access rights associated with the different data types. However this would lead to a static environment which would
run into problems when something differs from the ordinary. Another solution would be to have the person who pushes the information to decide which groups of people who gets different levels of access. The drawback with this solution is that it requires even more time from the person who shares information. A third solution could be to have a supervisor who is close to the project, for example the project leader to decide who gets to see what. However this would make it impossible to have the data available immediately after it has been pushed. There would be a lag until the supervisor checks the data and decides who should see it. This extra read-through of every piece of data would also take considerable amounts of time. Gaved, Heath, and Eisenstadt (2006) found in their survey that one of the most appreciated features of the wikis of locality that they examined was the fact that users were free to edit the data. I suppose that this makes people feel that they can contribute and it makes them more active. However this is difficult in a company like ABB where information may be classified (as mentioned in the interviews) and some types of information may only be edited by certain people.

As a final remark in this discussion I would like to add that I got the impression that information sharing was working better at Robotics than the other ABB companies I talked to. I got that impression because the people I talked to at Robotics had a more visionary approach to information sharing and most of the discussions during those interviews were about how the practices could be improved. At the other companies there was a lot more focus on how things were run now and how poorly it worked. I later got explained to me that the reason for the difference is that the other companies both face the challenge of geographically distributed development and of sharing information with companies who use different platforms and systems. Even though I don’t have enough concrete facts to back this up I do find this valuable information that is worth looking into.

7 Conclusions

7.1 Tools in use today

The conclusion from the interviews is that the most used tools for information sharing are telephone, email, Lotus Notes, and Lotus Sametime. Lotus Sametime is used for instant messaging and its drawback is that the information is not stored and can therefore not be reused (Wagner, 2004). Lotus Notes is used more as a repository for information than as a library where you browse and search. By repository I mean that a person may upload information there and then send a link to a colleague so he can go directly to the location of the information. This is an effective way for person A to send information to person B. However, if the information would be stored in a structured way so other people could find it as well a lot would be gained with a very moderate amount of extra work. This is in line with Wagner’s (2004) statement about searchability being the most important criterion for users who want to extract knowledge. But that is not how it works today. According to the interviewees, Lotus Notes is only effective when the exact location of the information is known. In other cases it is too complicated to find information in Lotus Notes so people prefer to find out who has the answer to their question and then directly contact the person either by telephone or email. Because of that, substantial amounts of information fail to be transferred from the individual to the organisation in accordance with the claims of Sangeeta et al. (2004).

7.2 How to improve information sharing practices

My conclusion is that the following needs to be done to make information sharing at ABB become more efficient, more general for the whole corporation and to make it become a
natural part of every person’s day to day work. The conclusions are based on the interviews I have made, the work I have read and my own knowledge and experience. The people I interviewed were ABB employees working in Sweden and Finland. However all of them had experience from working on projects that had members from several continents.

Reducing the amount of information and the number of tools
As it is today, way too many tools are used to store various types of information. The result of that is that people in need of information seldom find what they are looking for. As one of the interviewees said, it is easier and more efficient to find out who has the information and ask that person directly. If you don’t find information sharing that useful you will not prioritize doing it. Reducing the number of tools in use would increase searchability which Wagner (2004) claimed to be important and that would increase the willingness to add information which is in line with the findings of Wasko and Faraj (2000). The solution to the problems related to information sharing cannot be solved by some miracle system. What needs to be done is that information needs to be structured so that only relevant information is included and the amount of locations for information sharing need to become severely reduced so that users can find what they are looking for faster; a feature that Wagner (2004) claimed to be important for users who extract information from the system. It needs to be defined for every project what information that is relevant to share and only that information should be shared. It was mentioned in some of the interviews that a lot of the information that is demanded does exist in written form but is not shared or is even shared in principle, but those who might need it do not know how to find it. Information needs to be structured. Introducing a more easy-to-use and user-friendly system would definitely aid solving this problem but it would not be the solution itself. Further investigation is needed to define what types of data are really needed and stop producing and sharing the rest. When the exact types of data are known, you can start defining a system that supports the storage and retrieval of these data types in a user friendly way.

How to make people share information on a regular basis
My impression from the interviews is that the ABB employees have very busy days and that it is not easy to find time for additional tasks. I think that one solution would be to make information sharing an official part of every project and to have time scheduled for it both on a project and an individual level. This would send the message to the workers that this is something that management finds important and people would find it easier to do since they would have some of their time scheduled for it. This is in line with Hsu’s (2006) integrative approach. A solution of this character would obviously impose extra costs; it would need to be analyzed from a cost benefit perspective to see if its returns exceed its costs or not.

It would be useful if it was possible from a technical point of view to make people actually work in the information sharing system and automatically store their work there. This would be in line with Hsu’s (2006) tool based approach but it would also require an advanced system which in a user friendly way makes it possible categorize the new information. Furthermore, it would require some extra efforts from the user in terms of adding Meta data to make the information possible to find. Whether such a system is possible or not to implement is out of the scope of this thesis.

Information sharing practices would be improved if people were intrinsically motivated to share information. The interviews showed that one way to achieve that is to make people realize that information sharing does make a difference. A majority of the interviewees said that they would be more motivated to add information to a system if they used the same
system to extract relevant information. This goes in line with the community view presented by Wasko and Faraj (2000). The tricky part is how to establish the critical mass mentioned by Gaved, Heath, and Eisenstadt (2006). One way to do it is to make some people responsible for it as suggested by Westelius (2008). However it could lead to the same problem as Gaved, Heath, and Eisenstadt (2006) mentioned, namely that the whole information sharing establishment rested on the shoulders of a few key contributors and that in the long run sustainability became an issue. Monetary incentives are not preferred by the interviewees as they don’t think they would make such a difference. This goes in line with the study Hsu (2006) conducted. Today people seldom use the information sharing tools to extract information since they find it too difficult to find what they are looking for. This probably makes them less motivated to share information through the system.

7.3 Collecting information

Tool functionality
The actual task to share information should be as quick and easy as possible. This was the general opinion of the interviewees and Wagner (2004) claims this to be the most important feature for users who add knowledge to information sharing systems. The interviewees also find it important that the system is user-friendly, intuitive to navigate and looks attractive. I recommend a wiki based system since adding and editing information online is the quickest and easiest way I can think of. This is in line with the findings of Heath, and Eisenstadt (2006). A wiki may also facilitate discussions and browsing which could lead people to asking the right question which would help them reduce equivocality as Westelius (2008) mentioned. The interviewees also suggested a solution where you just attach a document and the system automatically integrates it into the wiki web page. You should also be able to edit the same document online. E-mail and telephone will always be used but my suggestion is that the wiki should replace the database functionality of Lotus Notes. If the wiki meets the expectations it would reduce the amount of e-mails and telephone conversations.

In order for this to work there needs to be well defined rules for where to put different kinds of information. It is up to management to have such rules defined and then make sure that everybody gets informed about them. I would recommend appointing a group of employees from several of the relevant divisions and making them responsible of defining these rules. Just like Westelius (2008) suggested they could also be responsible for getting the system started and establishing the critical mass that Heath, and Eisenstadt (2006) found to be necessary.

Several of the people I spoke to mentioned that the system should be web based so that it could be accessed from any computer anywhere in the world.

The real challenge of this part is to introduce one system for the entire ABB Corporation that is large and wide enough to meet the functional requirements without making it monolithic and impossible to handle. Grundy (2000) confirmed that this is a real challenge and to define the exact scope of the system is out of the scope of this thesis.

7.4 Storing information

What kind of information should be shared and how should information be stored and structured?
My conclusion is that it is close to impossible to have one system to meet all the information sharing needs. Even if it would be possible the system would either become impossible to handle or it would be so modular that it would be the same thing as several different systems. This goes in line with what Westelius (2008) claimed about a shared goal being necessary in order to make information exchange through an information sharing system useful. I do recommend that a few different systems are used but with one web-based entry point. This was also specifically requested by the interviewees.

The interviews have shown that two general categories of information need to be shared. The categories are official information and day to day information. The shared information needs to be structured in order to make the system easy to navigate but also to facilitate the input of new information. I find it logical that the highest level of structure is official information and day to day information. However if a wiki system is used links could be created between all kinds of information. So if there would be a relevant link between a page of day-to-day information and an official document this link would sooner or later probably be created by someone. What I refer to as official information is what Sangeeta et al. (2005) referred to as user requirements knowledge and project status knowledge. It would also be documents such as project plans, time plans, requirements, test reports, and so on. The system needs to support a formal review process in order to guarantee integrity of the official information. Day to day information could be basically anything that co-workers would discuss on the phone, over e-mail or during lunch. Of the knowledge types that Sangeeta et al. (2005) mentioned, functional domain knowledge, technical knowledge and project experience knowledge would belong to this category. It would be the challenge of the person who designs this system to provide the necessary base for people to structure this kind of information in relevant groups which would make it easy to add and find. My conclusion is that the wiki based system is particularly appropriate for this kind of information since it leaves a lot of room for people to store information in a way they find appropriate. The links between the pages in a wiki is created by its users and this should lead to a more relevant structure from the perspective of the users. If users find that certain pieces of information belongs in several places or should be linked from several wiki entries nothing says that could not be done. In one extreme this could lead to the system being overwhelmed with duplicate information and excess amounts of links to the same piece of information. If that would occur more structure related rules would be required to be implemented by those responsible for the system. However, at this point it is impossible to say whether this will be an issue or not.

How can information integrity be maintained?
With a formal review process in place for official documents there seems to be no concerns about information integrity. When it comes to other kinds of information, like day to day information, people seem to be comfortable with the reality of wiki systems, namely that any user could edit data. This goes in line with the findings of Gaved, Heath, and Eisenstadt (2006) where the freedom to edit data was one of the most appreciated features. However user restrictions needs to be in place, first of all to prohibit unwanted users but also to limit the amount of information every user has access to. There simply is no point for you to edit data you don’t even work with. However, it is important to keep in mind that user restrictions should not be carved in stone and the user restrictions have to be flexible enough so that users can request access to parts of the system they usually don’t have access to.

Something needs to be done about the fact that a lot of information is not the latest version and that there is no way to know whether this is the case or not. A solution that has been proposed by the interviewees is to have the system ask the user after a certain amount of days
whether earlier added information is still up to date or not. The request should be done in the information sharing system, not by email since there are already too many emails floating around. There could also be pre defined best before dates for certain kinds of information. To make sure that this does not become a burden for the users and actually make them avoid the system it would be appropriate to use this function only for information that changes frequently and that could be of interest to other people for a longer period of time. Another solution would be that certain people are appointed to be responsible for keeping information up to date so that all users are not bothered with this. There are also the kinds of information where different versions do not exist and the information stays valid for a long time. Obviously this kind of information should be excluded from this function so that the people who have uploaded such information do not get bothered with requests for regular updates.

7.5 Distributing information

The conclusion from the interviews is that the biggest problem is that information is close to impossible to find in the information sharing systems used today. As I have stated earlier there are way too many systems and too much information around and it is not structured in a way that makes it accessible. Something you can’t find is simply useless.

Every piece of information in the system needs to be properly indexed so it can be found. Otherwise it becomes useless. Furthermore the search functions of the system needs to be effective and intuitive to use. These are features that Wagner (2004) mentioned to be important.

One of the conclusions from the interviews was that people want to be able to subscribe to certain threads of information automatically. A solution for this would be something similar to RSS feeds where you choose the information types you wish to have sent to you. There could also be a certain area in the system where your requested information gets sent so it all stays within the same system. It needs to be considered how to keep this information up to date. If it will be located inside the information sharing one could make sure that the system automatically updates subscribed information as well. If RSS feeds are employed I don’t see any other solution than a new RSS feed being distributed every time an update is made to the subscribed information.

8 Future work

The purpose of this thesis has been to present a theoretical overview of information sharing and information sharing tools and to show the views of ABB employees both when it comes to the current situation at ABB and what they would prefer. This means that the empirical data used in this thesis has been the subjective opinions of the specific employees I have interviewed. Other employees could have different opinions about how information sharing should be conducted.

A future project could be to do observations at the different ABB companies and thereby find the exact reasons for the shortcomings that have been mentioned in this thesis. Another project could be to record telephone conversations and log emails to analyse the information flows through these communication media and thereby find out who sends data to whom. It would also show what kind of information that is shared and which situation that made this data exchange necessary. This would require a lot of resources as there are loads of emails and telephone to conversations to analyze. However if we would know who gives what to who and why they do it we would know a lot more which would be beneficial in the creation of an information sharing system that meets the requirements in a resource effective manner.
Furthermore, a study of that character could also shed some light on the question that Grundy (2000) claimed to be difficult to answer, namely how big an information sharing system should be. We would also know who to ask specific questions to as receivers of data should have more to say about how data should be distributed so senders of data could learn more about how data should be shared to be useful for the receivers.

A research project like this could face several challenges. For example, is it morally correct to tap people’s conversations without their knowledge? If not, how would the conversations look if the contenders knew that someone was listening, someone who reports to management?

I could not find enough literature about how a commercial wiki based information sharing system should be organised when it comes to the structuring of data types and user access levels. I believe that a future study which defined how to practically organize a wiki and perhaps even make a prototype would be highly useful.

9 Appendix

9.1 Interview questions

The following questions were asked during the interviews. However they were not strictly followed and sometimes the information was obtained without the direct question being asked. In a few of the cases some questions were left out because of limited time.

- What is it that you do in your job at ABB?
- What project are you working on at the time being? What is the project about?
- Is it a global project or is every member collocated?
- Which global projects have you been part of earlier? Tell me briefly about these projects.
- What kind of tools did you use for information sharing purposes? Which stakeholders were covered by these tools?
- How do you think that information sharing worked between the geographically dispatched units? What is the main reason for that?
- In your opinion, which functions are most important for an information sharing tool?
- What kind of information do you think is appropriate to share with a tool like that?
- What do you think about the idea to use a wiki for information sharing between geographically dispersed teams?
- Considering the fact that changing of contents is not that restricted, do you think information integrity would be maintained?
- Can you think if a situation where it is likely that integrity wouldn’t be maintained?
- Do you think you would prioritize to share information in a wiki? Would you need extra incentives to do that? What kind of incentives would that be?
- If sharing information in a wiki would be an official part of the project, would you share information on a regular basis then? Do you think there would be any delays?
- In your opinion, how does a wiki compare to a supervised database where you post information and someone reviews it and publishes it?
- Do you think the extra control of information integrity motivates the somewhat slower handling?
- Would you share more or less information in system where you wouldn’t see the information posted immediately?
9.2 Interview summaries

In this section I present short summaries of every interview I have conducted. Each summary highlights what was discussed during that particular interview and how the interviewee responded to the questions I asked. To ensure confidentiality I have called every person “she” even though there were both men and women among the interviewees. I have also removed in which country the subject is working but it is either in Sweden or Finland. The countries in which the interviewee’s projects are being conducted were also removed to ensure confidentiality. The projects are conducted in one or several of the following countries, Sweden, Norway, Finland, Switzerland, the United States, Germany, China and India.

9.2.1 Interview number 1, 2007-10-25

This person’s job title is quality manager for R&D since almost a year back but most of her time she works with process development. As a quality manager she is supervising the quality from several ongoing projects. So she is exchanging information with several projects concurrently. At the moment she is working in a project about project development and performance improvement. This is a global project with participants from several countries. She has been working with ABB since the year of 2004 and most of the projects she has participated in have been global.

When it comes to tools for information sharing, they use Lotus Notes which has a database tool where you can upload documents. She thinks that it is a disadvantage that in order to change a document, you need to download it, edit it, and then upload it again while it would be preferred to be able to edit it online. She says that the Lotus Notes database works satisfactory when it comes to sharing official documents like project plans, requirements specifications etc. but that the information is not always where it is supposed to be since although there are directives for how to share information people interpret them differently depending on culture among other factors. She also said that you never know whether a document is up to date or not and the follow up on uploaded documents is generally bad. In the interviewee’s opinion there is room for improvement but she is not sure that Lotus Notes is the right tool for that. I got the general idea that she prefers contacting people directly with questions instead of looking for the information in a tool. However it appears that the reason for that is the fact that most of the time you don’t find the answer you are looking for in the Lotus Notes database. The person interviewed said that due to the fact that you seldom know whether a document is up to date or not the Lotus Notes database is more useful for historical information instead of more recent data.

Besides the Lotus Notes database, the unit where the interviewee is working also uses Lotus Sametime, which is an instant messaging system and they have another tool for requirements management. A drawback with Sametime is that messages are normally not logged so any information exchanged there gets lost. She stated that it would be advantageous to have everything in the same tool but that she thinks that it would be very difficult to achieve. A more achievable approach would be to have a snapshot of relevant information in the main system but to have details and exchanged being handled by specific tools.

She is positive to the idea of a wiki based system. However she doesn’t think that the usual problems with information sharing would go away just because a wiki is used. She thinks that the difficult part would still be to actually make people share information in time and to keep the information up to date. We did discuss the possibility of having the system ask users whether previously posted information is still valid or not. According to the interviewee this
could make information more up to date but it should be done within the system and not by
sending emails. One way to solve could be by making the system ask people when they log in.

When we discussed for what kind of information a wiki could be useful and whether
information integrity would be threatened she said that a wiki could be mainly used for
exchange of official documents like project plans, requirement specifications, test reports etc.
For this kind of information it would be necessary to have them officially validated by
someone and it would be advantageous if you could have different status for documents in the
system. For example you could have status draft, checked or approved like in Lotus Notes.
Besides that she thinks that a wiki system could also be used for sharing informal information
like different kinds of work related discussions. In this category she does not find information
integrity to be an issue and she stresses that simplicity and the absence of obstacles is
important to make people share information. On the issue of how to structure information her
opinion is that the structure should be consistent with the way work is done, for example like
the GATE-model. She pointed out that a clear distinction between different document types is
important.

The last topic we discussed was how to motivate people to actually share information. In the
opinion of the interviewee people from different cultures need different incentives to do
things. In Finland you do something if you can see that it is useful for somebody so for people
from those kind of cultures she thinks that if they would extract information from the system
they would also push information into the system. However she thinks that in other cultures
management telling people to do something has a stronger effect.

9.2.2 Interview number 2, 2007-10-26

The respondent is working as a system architect and her main responsibility is coordination of
construction and technology related issues of different geographically dispatched projects.
This means that her task is to make sure that the different pieces constructed by the dispatched
projects do fit together. These projects are distributed over several countries.

When it comes to methods of sharing information, there is a lot of room for improvement
according to the interviewee. She says that most of the communication is done through emails
and face-to-face-meetings. Even though most of the project teams do have some sort of
information sharing or groupware system, every team uses different systems which are
incompatible with each other. So in her opinion the sharing of information inside the projects
is working fine but between different projects it’s not satisfactory at all. She also said that she
would appreciate a general tool for sharing information because it would make it possible for
her to gain access to more detailed information about the different projects. As it is now, most
of the general information reaches her but she has no access to more detailed information
unless she finds a specific person to ask directly.

The respondent is very positive to the use of a wiki technology based system and she stresses
out as one of the key functions that you should be able to choose which information category
you wish to have posted to you so you don’t have to look for it through an endless ocean of
information. She brought up RSS-feeds as an example for the structure. Another function
which she said that she would find useful is if the system was able to upon login remind users
of different information related tasks that needed to be done for example verifying validity of
earlier supplied information. She is not worried about information integrity in a wiki based
system. She finds direct abuse very unlikely but she did say that incentives are very important
on a managerial level in order to make people take the task of sharing information seriously.
She mentioned that one way to do it would be to make information sharing one of the requirements for receiving project funding.

As we proceeded speaking about information integrity the interviewee said that it would be important with different user permissions where only some users would have access to add or edit certain kinds of information. She also talked about traceability as an important factor since people tend to behave more properly when their actions can be traced.

9.2.3 Interview number 3, 2007-10-26
The interviewee works at Process Automation. At the time being she is not part of a particular project, instead she is working with project related processes. The goal of her work is to make the necessary improvements to heighten ABB’s SEI rating. SEI is an organisation that is rating the maturity of corporations when it comes to conducting projects. When it comes to experience of distributed projects, the respondent has been the leader of several projects with members from several continents. In the past, she has also been working as a system program leader where her task was to coordinate 15 different projects to make sure that they were working towards the same goal.

These project groups communicated by sending reports and holding weekly phone conferences. According to the interviewee, the problem with the reports was that there were too many reports to write which decreased the quality of the reports. Every project leader had to write reports for her local office and for the global management as well. The different reports had similar content but different disposition which made the report writing too much of a burden and therefore it got done with less ambition.

We discussed the possibility to use an information sharing tool instead of emailing the weekly reports. In her opinion it would be desirable to have the possibility to push certain types of information to everyone in the project groups while some more role specific information could be pushed only to people within a certain role or category. That way the amount of excess information received by each person would decrease and in my opinion that would make people pay more attention to the information they receive.

The reports that the respondent was sending to people needed to be approved so functionality to approve certain documents would be wanted. For these kinds of official reports it would be important that nobody could edit the documents. However, when it came to different types of information she prioritized information accessibility and the speed of processing ahead of guaranteed integrity.

We also discussed the necessary incentives for making an information sharing system work on a regular basis. The subject said that she absolutely thought that incentives were needed but she couldn’t come up with a solution for how to provide the needed incentives.

9.2.4 Interview number 4, 2007-10-29
The interviewee works with product integrations, base software development, project coordination and configuration management. At the moment she is working with in a global project with people from several continents. This project has been going on for two years and it is the interviewee’s first project at ABB.

When it comes to information sharing they use different tools for different purposes. They have one tool for configuration management called Serena Dimensions which is used as a
common repository for sharing code. It is also used to store some documentation, change management and bug reports. For exchanging documentation, they also use Lotus Notes. For sharing product data they use a separate R&D and Product Information Database tool. They also use Lotus Sametime which has been mentioned earlier. The person I interviewed said that Lotus Sametime and common email are the most usual ways of communication.

When we moved on to talking about how well information sharing is working her opinion was that even though a lot of information is shared and available for everyone, new information and updates are getting added slowly. It happens sometimes that people make changes to code without telling anyone and that you just notice that the programs stop working. Then you have to figure out who could have made the change, call her and ask her what she has done so you can make your components adapt. The interviewee said that some people do send emails about their changes but not everyone.

About the most important functionality of an information sharing tool, the interviewee said that she would like to have a location where all the recently made changes could be seen and also the name of the person who has made the change. Some sort of automatic change reporting tool would be useful and make this more achievable. After that she moved on to talking about documentation. She pointed out several flaws with the systems they use at the moment. For example, in Serena Dimensions documents are stored as files and not in a structured way so it is very hard to actually find the files without having an exact link to them. She said that she would prefer one entry point in the system from where you could find all documents related to the project. She also mentioned the version handling system, which she thought was good for handling code but that traceability was really bad. In her opinion it would be better to also have the code documentation available from a central entry point. In the end of the interview she also added that she would appreciate the possibility to edit documents online instead of having to download them, edit them and then re-upload them as it is done in Lotus Notes.

The use of a wiki-based system is a good idea according to the person I interviewed. She thinks it would be best suited for all the information where the most recent information is the most important, such as user guidelines or quick references. When it comes to detailed descriptions and documents that needs to be version handled and reviewed a wiki wouldn’t work unless you implement functionality for version handling or document status handling. She doubts it would be worth the effort to implement that. To conclude the discussion about what kind of information to share she said that the information you have to ask people about today would be good to share in a wiki based system while official documents are already shared in satisfactory ways. When we talked about information integrity in a wiki based system she said that wikis are self-correcting. If you use a system frequently and you find something that’s incorrect you probably will correct it. However one condition for this to work is that it is used frequently. She does not think that official documents and documents that directly define code could be handled like this. For documents like that you would need some kind of status handling and a supervised database might be more suitable for that kind of documents.

We went on talking about how to make people share information on a more regular basis, the interviewee stated that normally people share information when someone asks them to do it. They don’t do it automatically. She added that even if people only shared information when being asked to it would still be good since now everyone who needs the same piece of information needs to ask, sometimes even several times. She does not believe in a system
where people are more or less forced to share information, she thinks it is okay if someone needs to ask for it the first time.

When I asked the interviewee whether she had any last comments to add she said that you need to realize that different people need different kinds of information and different levels of detail. The system should somehow support it and to implement an intelligent search tool in a large system that contains loads of different information is very difficult. One way to solve the problem could be to use a system which uses different kind of layers where you can put information in a structured way.

9.2.5 Interview number 5, 2007-10-29
This person works as a technical leader and PCM architect. She has been with ABB for a long time. Right now she is working on a project which is developing a product called PCM600. The development in this project takes place in three countries in two different continents.

For information sharing they use the project database of Lotus Notes, Lotus Sametime for instant messaging, Serena RM for Requirements Management and then they have a common CM-system. They have weekly project meetings over the phone or by using netmeeting or Lotus Sametime. She said that there is a lot of informal communication through phone, email or Sametime. In her opinion both official and more informal communication is needed. We spoke about the Lotus Notes database which appears to be used quite frequently at ABB. She said the following: “You don’t really find information that easily, you need to know in which database to search so the search function is not so good”.

When we spoke about tools for sharing information she thinks that the most important features are that it is easy to search and find information and that the information is up to date. In her opinion the type of information best suited for being shared in a tool is technical documentation and description of components. She thinks that it’s not so appropriate for information that should not be seen by everyone so user restrictions are necessary to guarantee different access levels as well as traceability.

We also discussed a wiki based system which she thought could be a good idea. However she said that some kind of review process would be necessary for certain kinds of information. She also mentioned that a situation where it would be hard to maintain information integrity would be when a developer of a certain component is writing a description for a component which contains a description about another component. The second description then runs the risk of being not that good.

How to make people share information was the next topic. The interviewee said: “It would be really beneficial if people would share info like this”. However she thinks that they would need extra incentives and that people would need education in how to document everything they do. Another issue is that people have far too little time which would need to be corrected before another task is added. Ultimately it’s up to management to add it as an official part of every project which in the opinion of the interviewee would be good. People would also need to be reviewed on their information sharing work. She said that another important aspect is that people tend to share more information if they themselves use the system to extract information.

We concluded the interview by talking about supervised databases like Lotus Notes against Wiki based systems. She said that it is very important that different pieces of information in
the system are not contradicting each other. For some types of information a supervised database is to prefer but that is because of the review functionality.

9.2.6 Interview number 6, 2007-10-29

The interviewee is a member of the management group of R&D and project planning. She is also working with CMMI which stands for Capability Maturity Model Integrated. CMMI is a model for developing software and they use it to improve their processes. The goal is to conduct work as similar to the model as possible. Then you can get CMMI certified which is a demonstration of quality. Most of the R&D projects are global and the trend is towards more globalization of R&D. The projects in which the interviewee has participated have had participants from several continents.

For information sharing they use several tools. First of all they use the Lotus Notes database and when they communicate, the majority of it is through email. They also have an intranet with process related web pages. These web pages show process frameworks and they are accessible by most employees of the unit. There are user restrictions and some information of the more sensible kind is of course only visible to people who need access to it. Furthermore, they have one system for requirements management, one for version management of code, one for product management and one for staff management.

The person I spoke to is not satisfied with the way information sharing tools work today. She says that it is difficult to find what you are looking for in most of the systems. She took the Lotus Notes as an example for a system which is hopeless when it comes to sharing documents and version management. She said there is a lot of information in Lotus Notes which nobody knows how to find. She also claims that the infrastructure is not working satisfactory and that you often encounter delays or that you cannot access the systems at all. She said “One can’t believe this is year 2007”.

About a large system for sharing information she thinks that it is close to impossible to have all information collected in the same system. She said it would be too large and complex and it would be inevitable to make it modular, on the verge of divided. So basically it would end up where we are now. She also pointed out that people from different cultures are different and that they prefer to share information in different ways, another obstacle for one large system. Building such a huge system would be very costly and building information systems is far away from ABBs business according to the interviewee.

About wiki based systems, she thinks that it would be beneficial to use it for sharing the process maps mentioned above. She thinks it would be beneficial if people could change them on the fly because it would reduce the gap between how management thinks people should work and how they actually work. However some supervision would be necessary. She also thinks that protocols from project meetings, status updates and test results could be types of information suited for a system like that. When it comes to information integrity she doubts that it would be jeopardized in a system like this, but as stated earlier, some supervision is needed.

We went on talking about how to make people frequently add information to the system. She said that the critical part is to make people realize the purpose of sharing information. If you can show it to them they will use it. So that’s the challenge for group that would incorporate this way of working. She does not believe that certain economic incentives are needed; she thinks the chance to make a better job is enough.
As some final remarks she added that today the problem is the infrastructure not the systems themselves and the way people use them. She thinks that a large system would create more risks for problems and that we should focus on improving the way we use the existing systems.

**9.2.7 Interview number 7, 2007-10-29**

This interview was different from the others because the interviewee had very strong opinions about the topics we were about to discuss. She is an engineer and she said she will give me the engineers’ perspective. About the tools for information sharing that are used today she only mentioned Lotus Notes. She said that the advantage is that it is very simple and that is the reason that it is usable. However she claims that is very difficult to find information in Lotus Notes unless you are really familiar with the structure of the project so that you know exactly where to look.

“Only technical information is worth sharing, an engineer does not care about organizational information”. The only part of the big picture that is interesting for an engineer is how her piece of the puzzle fits the big picture. She also mentioned the development model which she thinks could be shared in a global system so that every person could follow it more precisely. However she did criticise the model that is used at the time being, the GATE-model, for being focused only on decision making and badly synchronized with engineering and development.

In her opinion what needs to be perfectly clear is who will be using an information sharing system. When we know that we will also know what kind of information these people will want to share and that will decide the structure of the system. So a role perspective is very important where you try to fully understand the user. If the system is meant to be used by engineers and developers there is one important factor, namely that the engineer writes what she has done, not what people want to read. This causes problems in information sharing. Roles are important and in order to develop a system used by several stakeholders the role perspective needs to be clear and supported.

When it comes to incentives she believes that the strongest incentive is that it is making a difference. If people see that sharing information helps the collective goal than they will do it. But to make them realize it the wheel first needs to start moving. For that to happen you first need directives from management to give people a chance to see the advantages. Another important factor is that the system needs to be simple and user friendly so it does not become a burden to use. It is also important to see information sharing as a natural part of the development process not as an optional tool which is there to facilitate work. How we share information should also be strongly related to the way we work so it becomes more natural to do it on a regular basis.

About information integrity she thinks a wiki can be self-correcting but that some critical information needs to be formally approved.

**9.2.8 Interview number 8, 2007-10-30**

The subject in this interview has a background in software engineering and is working as a project leader at the moment. She is leading a project which is about making distributed development easier. This is a distributed project with members from two different continents. She is also project leader for the Swedish part of another distributed project which is run with members from China and Sweden.
To share information they hold weekly telephone meetings. They also use some open source tools like wikis, blogs and project portals. The difficult part is to make information flow in a continuous way. She also said that information accessibility is key and very difficult. Most of the time it is really difficult to find archived data. Besides information accessibility she thinks that the most important feature of an information sharing tool is that it is intuitive to use. She says that how good people are at sharing information depends on their position in a project. For example the people from India share information frequently because they need information more than the Swedish who are not depending on information flows as much as the people from India and therefore they don’t prioritize sharing it.

When I asked her what kind of information she thinks would be good to share she said project plans are very important to share. She said “There are people who still does not know I am the project leader” so basic project information is very important to communicate to every member. It would also be a good feature if the system could remind it’s users of when certain key events are coming up. What the project is supposed to deliver and when is also appropriate to share in an information sharing tool. She did point out that no matter how good portal you have the information sharing will only reflect the quality of the project. So don’t expect any extreme results, just the possibility to make a sound project work even better.

We went on talking about wiki based systems. She thinks wikis are good but she thinks every user should not be allowed to change all kinds of information. She also said that it should be able to archive information for a long period of time and to guarantee that it is stored safely. She thinks that information integrity shouldn’t be a problem as long as every entry gets logged so that people can be held responsible.

The last topic of the interview was how to make people share information on a regular basis. She said that this should be managed both on a project level and on an individual level. On the project level the corporation should allocate resources so every project could have a person responsible for information sharing. This person should constantly provide demand for the information every person possesses. On an individual level it is important to include information sharing when evaluating productivity. Another thing that would help is if all the members of a global project could at least once have the opportunity to meet face to face. People would be more motivated to share information if they would know who the recipient is. She also added that if you make the system attractive and more easy and fun to use people would use it more frequently, it is that simple.

9.2.9 Interview number 9, 2007-10-30

This person works as a software architect focused on application functionality. She is working on new software, not updates and she has ten to twelve years of experience from development. She has been working on the 580 product-family where she was responsible for application functionality. She said that this project contained a lot of very skilled people which lead to a lot of discussions so simplicity and ease of use got compromised. Another project she was part of was about structuring knowledge that was spread and duplicated. Most of the geographically dispatched units participated, units from two different continents.

The interviewee said that they use way too many tools for information sharing. They use Lotus Notes which according to her does contain a lot of useful information. The problem is that the information is hard to find and that it is hard to learn for new people and nobody really makes an effort to teach new people how to use it. Then they use two different tools
from Serena, one for configuration management and version management and another for test reports and discussions. She said that there is no link between the two Serena tools. They have one tool for electronic document management which has its server on a very slow connection in Germany. She said that it is “impossible to search in that system”. She also said that “the infrastructure is pathetic”, that everything is very slow. Other tools they use are SAP for time reporting, Lotus Sametime for instant messaging and a PID-database to store code. She said that they are working on an AFL-portal which is supposed to be intranet based. During our whole discussion the interviewee communicated that there are too many tools in use and that you never know in which tool to look for information or where to push information. She said that right now the most important mission would be to limit the number of tools to a few.

When it comes to the most important characteristics of an information sharing system the interviewee prioritizes accessibility and filtering as the most important aspects. “We are drowning in information” is one of her quotes so filtering and structuring is as important as accessibility according to the interviewee. You need to be able to access what you need without being forced to read ten times as much data before you find it. She thinks it would be beneficial to have a web based entry point so you can access the system from any computer. She also wants the system to be able to push information, for example like RSS-feeds where you subscribe to certain groups of information and the system will push them to you.

When mentioning a wiki based system the interviewee thinks it is a good idea but it is critical that it would be used to replace several of the existing systems, not to add another one. She once again stressed the importance of a web based interface and the possibility to have subscriptions. About information integrity, she said that the activity of the users is critical. The wiki idea is based upon the fact that when the number of active users becomes large the system becomes self-correcting. She believes that around 80 percent of the users need to be active to make the system self-correcting.

The last topic we discussed was how to make people share information on a regular basis. She thinks that one way to solve this problem would be to have it as an official part of the project, that is to make it a part of the time plan both on a project level and on an individual level and to include information sharing in productivity evaluations. It would also help if there was a specific person who was responsible for information sharing activities.

9.2.10 Interview number 10, 2007-10-30

The interviewee works as a Q&A-person. Her job is to supervise the ongoing projects and make sure that they are following process descriptions. The projects she is supervising have members located in three different continents. Every project has one member who is responsible for reporting to the interviewee and she is the one supervising the projects in the location where she is. She has had this role for about five to six years and before that she has 10 years of experience in quality.

When it comes to information sharing tools, different tools are used to communicate with people from different parts of the world. Since this person is only working with supervising how the different projects are being conducted she does not receive product specific data. Most of the information she receives are plain documents. She uses a tool called Documentum for sharing these documents and it is mostly people from India who upload their documents there. With people from the same location as the interviewee the communication is face to face while with other people from Sweden the communication is trough phone meetings or Lotus Sametime. When it comes to Germany and the US most of the
communication is through telephone or Lotus Sametime. She thinks that information sharing works good in general, the only issue is the fact that phone line quality to India is poor and that people from India are difficult to understand when they speak English. Hence written communication is preferred with them. She thinks the structure for sharing information is good and people usually respond quickly to emails.

She thinks that information sharing tools are most appropriate to spread test-reports, changes, plans and general project information. At the moment they use project web pages for most of the projects and she thinks that this is one of the main reasons for the success of their information sharing. This could also be done with an information sharing tool.

When it comes to wiki based systems she does not see that she would benefit that much from using them. Most of the info she shares does not need to be stored for later use and some of it needs to be formally approved. Wikis are not optimal from those points of view. She does not think that information integrity would be severely jeopardized in a wiki system but she does not see the point of taking that risk.

The last thing I asked her about was if there was any need for special incentives to make people share information and she replied that people already share information in a good way and extra incentives are not needed.

**9.2.11 Interview number 11, 2007-11-01**

This person is working with requirements management and the tools you use for requirements management. She is also working with R&D and as a team leader coordinator. She is part of or working with several projects and all of them include people from several locations.

For information sharing she uses Lotus Notes for sharing project related information and requirements specifications. She said “Lotus Notes is the base place for information”. She also uses Lotus Sametime for instant messaging and regular email. She says there is a lot of room for improvement when it comes to information sharing. She would prefer a more community like way of exchanging information where the information gets updated constantly. As it is now people send out documents now and then and if you need specific information you have to find out whom to ask for it and contact them and ask.

I asked her about the most important features of an information sharing system. She said that the system should be intuitive and easy to use and she thinks it would be good with a recent updates screen when you log in so you automatically see what has changed since your last log in. She thinks that the big challenge is to make people use it. She also thinks that an information sharing tool would be good for all kinds of information but that some kind of the information should only be accessible by a limited set of users.

I went on and asked her about the wiki idea. She said that she thinks using wikis is a good idea and that she had some experience of using local wikis in projects. Compared to Wikipedia it would need to be more closed with different user access rights. She also mentioned that it needs to be possible to have a more formal review process for some kinds of official documents but that every day information can flow freely and be edited freely. She also thinks it would be advantageous to have a certain group of people checking the validity of the information. She is not worried about information integrity more than that there is a risk that you can find outdated information.
When it comes to incentives she would personally share information frequently because she has seen the advantages of it. She thinks that people need to see how useful it can be in order to really take it seriously. One solution to make them realize that would be to have a small group of people push information on a regular basis so that the rest of the people can see how useful it is. She does not think that a directive from management would make as big of a difference but it could also help.

As a final remark she said “I think we are eventually going to this community way of doing things”. She also said that one of the challenges is that there is too much information and that structuring it is critical for it to be useful.

9.2.12 Interview number 12, 2007-11-01

This person is responsible for development processes. She is working in a unit responsible for processes and infrastructure and it is composed of several project leaders who are leading both local and global projects. The interviewee is also working with system integration. Most of her experience is from local projects but lately there has been a few global projects with members from two different continents.

Most of the communication is through email and she said that large challenges are waiting ahead of them when it comes to information sharing. They also use SAP to archive design and product data. In her opinion the user interface of SAP is bad and it is difficult to search for information. TeamSystem is a tool for global management of code which has support for configuration management and version management. There is an errand management system which is a part of TeamSystem. She thinks that a good way to have it organized is to have hardware related information in SAP and software related information in TeamSystem. In her opinion it is necessary to have different systems for different kinds of information but the number of systems should be limited to a few and they should be linked together. Besides that she said that easily manageable access groups are key in an information sharing tool. You need to be able to have a good overview of who can do what and it needs to be easy to change. She also said that there is a need for a global document sharing system with a user friendly interface. She mentioned SharePoint as a good example which is used today in some parts of ABB.

She believes that the idea to use a wiki based system to share information is good but the original idea needs to be somewhat modified because in a large company like ABB everyone can not have access to all kinds of information and especially not have the right to alter all kinds of information. But with those limitations added it could work really well. When it comes to less critical kind of information she thinks that it is worth to risk information integrity because if you would have to formally check everything that is shared it would significantly slow down the whole information sharing process.

She does not think there is a need for any extra incentives to make people share information. People have already realized the need for effective information sharing and that should be motivation enough. However it does need to be an official task in every project so that time is scheduled for it. That would also send out the message that this is an important part of every persons’ job. She also said that the system should be engineered in a way that it makes people work in the system. It should be the standard place to store documents even when they are still drafts or not even half finished. That way everything would automatically end up in the system.
10 References


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