UPTEC STS08 017
Examensarbete 30 hp
April 2008

Supporting collaboration in dispersed organisations using computer software

eCollaboration in AstraZeneca

Jonas Myhr

UPPSALA
UNIVERSITET

Teknisk- naturvetenskaplig fakultet
UTH-enheten

Besöksadress:
Ångströmlaboratoriet
Lägerhyddsvägen 1
Hus 4, Plan 0

Postadress:
Box 536
751 21 Uppsala

Telefon:
018 – 471 30 03

Telefax:
018 – 471 30 00

Hemsida:
http://www.teknat.uu.se/student

Abstract

Supporting collaboration in dispersed organisations using computer software - eCollaboration in AstraZeneca

Jonas Myhr

AstraZeneca is a pharmaceutical company developing, producing and selling prescription medicine in over 100 countries. Information and communication technologies (ICT) are a potent mean for lowering the barriers caused by dispersion in space and time. The aspiration of this study is to understand how collaboration supported by electronic means (eCollaboration) can be improved in AstraZeneca. Are proper tools in place and what factors affect adoption of eCollaboration practices?

Data gathering was conducted in a globally distributed manner by a university student team consisting of six members based in China, France, Sweden, UK and the US. The team performed interviews with numerous AstraZeneca employees and stakeholders and also experienced firsthand use of AstraZeneca eCollaboration capabilities.
Supporting collaboration between employees depends on the type of relationship that binds them together. Ties can be characterised as strong, weak, or potential depending on intensity and information flows. A major finding of this study is that the current eCollaboration platform in AstraZeneca mainly supports collaboration via strong ties.
Further, facilitating factors for eCollaboration have been identified and divided into three categories; tools, cognitions and structural properties of an organisation. Having a consolidated and integrated eCollaboration platform, with a high critical mass of users is important for adoption. Policies for information access and sharing, as well as an incentive structure adapted to collaboration are identified as important structural properties for effective use of eCollaboration.

Handledare: Marybeth Ferrante
Ämnesgranskare: Arnold Pears
Examinator: Elisabet Andrésdóttir
ISSN: 1650-8319, UPTEC STS08 017
Sponsor: AstraZeneca

Populärvetenskaplig beskrivning

Att samarbeta med människor som inte befinner sig på samma plats som en själv är inte alltid lätt. Läkemedelsföretaget AstraZeneca har 67 000 medarbetare utspridda i över 100 länder. Dessa medarbetare samarbetar globalt för att utveckla, producera och sälja receptbelagd medicin på ett effektivt sätt. Tidsskillnader och geografiska avstånd sätter upp hinder för effektivt samarbete då man inte har möjlighet att träffas personligen så ofta som man skulle ha gjort om man varit stationerade på samma plats och man har även få överlappande timmar av arbetstid i vissa fall. Elektroniska verktyg kan underlätta samarbete inom en distribuerad organisation som AstraZeneca genom så kallat eSamarbete.

För att ytterligare förstå och förbättra hur samarbete mellan globallt utspridda medarbetare inom AstraZeneca kan underlättas har en global eSamarbetsgrupp formerats med medlemmar placerade i Frankrike, Kina, Sverige, Storbritannien och USA. Gruppen har bestått av universitetsstudenter och har letts av Jonas Myhr och Jens Bäckbom från Sverige. Gruppen har helt förlitat sig till elektroniska verktyg för samarbete och inte träffats under hela projekttiden. Anledningen till att använda en globalt utspridd grupp var för att få en ökad förståelse för eSamarbete men särskilt för att hämta in en mer heltäckande bild av nuläget i olika länder inom AstraZeneca då gruppens resultat skall används som material till en företagsomfattande eSamarbetsstrategi. Gruppens huvuduppgift har varit att ta fram förslag på hur eSamarbete inom AstraZeneca kan förbättras. Vilka verktyg behöver finnas på plats och hur främjas användande och hur reduceras hinder?

I en distribuerad organisation såväl som i en samlokaliserad finns det människor man har en stark och nära relation till, med vilka man ofta utbyter information av större djup. Utöver det finns även en större grupp av människor man har en svagare relation till, tidigare arbetskamrater inom olika projekt eller personer man är bekant med från en introduktionskurs t.ex. Slutligen finns en grupp av människor man skulle kunna ha utbyte av om man bara visste att de fanns och hade en möjlighet att komma i kontakt med. I en distribuerad organisation är det mycket svårare att underhålla och inleda relationer då möjligheterna att utan förberedelse råka stöta på varandra är starkt begränsade.

Inom AstraZeneca finns grundläggande eSamarbetsverktyg och processer på plats för att stödja mindre grupper och anställda som har en starkare relation. Min studie visar dock att stöd för underhåll och utnyttjande av svaga och potentiella länkare mellan anställda har utvecklingspotential. I rapporten ges förslag på nya verktyg som kan introduceras för att underlätta underhållande och utveckling av relationer med människor man delar en svag länk med. En utvecklad funktion för att hitta andra anställda med vissa egenskaper kan underlätta utnyttjande av potentiella länkar men även bidra till snabbare etablering av svaga och starka länkar genom ökad information om personlig bakgrund osv. I min forskning finner jag även att det finns även en rad grundläggande och möjliggörande aspekter att ta hänsyn till för att eSamarbete skall fungera effektivt. De kan delas in i tre kategorier, tekniska, kognitiva och organisationsstrukturella faktorer.

En organisation behöver ha en konsoliderad uppsättning av eSamarbetes verktyg som är väl integrerade med mer frekvent använda verktyg för kalender- och filhantering. Att ha flera olika verktyg på plats för liknande arbetsuppgifter ökar belastningen på den enskilda användaren att försöka avgöra vilket verktyg som skall användas i vilken situation. Vidare är användbarhet ett viktigt tema för att kunna nå en kritisk massa av användare, på samma sätt som telefon och e-post har nått genomslag. Att verktygen är integrerade med andra, mer frekvent använda verktyg är viktigt för att minska antalet extrasteg en användare behöver ta för att samarbeta och dela information.

Att ha arbetskamrater på andra sidan jorden, som man aldrig träffat kräver en kognitiv förståelse för ett förändrat arbetssätt och det påverkas av sättet man förstår och uppfattar stödprocesser som eSamarbetsverktyg. Hur man informerar och utbildar medarbetare i eSamarbete är därför viktigt. T.ex. fokuseras utbildning av användare lätt på hur man använder ett specifikt program som kan användas till distribuerade möten istället för hur man bedriver effektiva distribuerade möten, där dataprogrammet bara är en stödjande komponent och inte ett mål i sig.

Min forskning visar vidare att framgångsrikt eSamarbete är beroende av att vissa organisationsstrukturer finns på plats. Processer för att dela information och med vem man kan dela vilken information med är viktigt för medarbetare i AstraZeneca, då läkemedelsbranschen präglas av stark immaterialrättsliga krav men även hanterar känslig information om patienter. Hur företagsledningen lyckas balansera mellan individuella prestationsersättningar och kollektiva ansatser genom samarbete påverka också intentioner hos användare att ta till sig samarbetsverktyg.

En analys av läkemedelsindustrin visar att eSamarbete förmodligen kommer bli ännu viktigare under kommande år. Nya geografiska marknader kommer att öka i betydelse samtidigt som större kostnadsfokus förmodligen kommer att påverka resebudgetar, ett område där eSamarbetsverktyg skulle kunna ersätta vissa möten.

“Many ideas grow better when transplanted into another mind than the one where they sprang up”

Oliver Wendell Holme

Contents

Figures

Tables

1. Collaboration in distributed organisations

Collaboration is nothing new. Man has seen the advantages of collaboration since starting to form hunter/gatherer societies. Globalisation of markets, resources and production are forcing industries into an increasingly challenging collaboration environment. Multi-national corporations no longer consist of distributed entities working rather separately from each other and value chains are becoming more globally integrated. Globalisation made production chains globally integrated and is in the process of integrating other functions such as research and development on a global basis. These processes can be called geo-functional specialisation. Geo-functional specialisation means that companies deemphasise the importance of borders and acknowledge that different countries have different fields of specialisation. Companies active in this environment are facing great challenges when it comes to coordination, communication and control of teams and projects that are globally dispersed, but they are also facing great opportunities if they are able to positively exploit geo-functional specialisation. Information and communication technology (ICT) can be of great help when collaborating and communicating over time zones and distances.

AstraZeneca is a global player in the pharmaceutical industry faced with all the challenges described above. Active in over 100 countries AstraZeneca is faced with the challenging task of facilitating collaboration between employees based in different cultural contexts, different time zones and different intra-organisational cultures. In connection with the challenges associated with collaboration through electronic means (eCollaboration), an enterprise wide eCollaboration strategy initiative has been initiated within the AstraZeneca IT-function. This has been initiated to improve how eCollaboration can facilitate the work for distributed employees that jointly develop new products and processes. Enterprise wide in this context means that the final strategy recommendations should take into consideration the whole of AstraZeneca and also leverage advantages that emerge from global scale.

An eCollaboration strategy team has been formed within AstraZeneca and in addition to that, a global university team consisting of students from China, France, Sweden, UK and US has been formed to provide input from local business units as well as a direct experience of how a globally distributed team collaborated through eCollaboration tools.

1.1. What does eCollaboration mean in this thesis?

eCollaboration is a broad term for collaboration supported by electronic means. eCollaboration could involve many types of electronic means but in this thesis eCollaboration is defined as collaboration and communication between humans, mediated by computer software. Video or telephony via computer software is however excluded; issues around such tools are being addressed by other strategic initiatives within AstraZeneca.

1.2. Study objectives

The aim of this study is to *investigate how collaboration between people, working in a dispersed organisation like AstraZeneca, can be supported through use of computer*

software. For the AstraZeneca eCollaboration strategy to be successful tools must be in place to support collaboration. Aspects not directly related to tools, such as information, training and organisational support, must also be considered.

The research goals can be decomposed into several more tangible research questions. I will take a user centric perspective and focus on the end-users, since my research aim mainly focuses on collaboration between users, and the barriers those users face.

- What characterises collaboration between knowledge workers? To be able to support electronic collaboration we need to understand the general characteristics of collaboration between knowledge workers.
- What are the attitudes and perceptions towards the currently employed eCollaboration tools and procedures among AstraZeneca knowledge workers? This question may also turn out to be interesting from other perspectives than just focused on tools. Do people know about tools? Do they perceive training as adequate? Approaching eCollaboration from this direction may reveal both benefits and drawbacks.
- How can eCollaboration improve and evolve, taking knowledge about the current situation, piloted eCollaboration tools, experience from other researchers and the changing business environment into account? What strategic messages should be forwarded to the group responsible for developing the AstraZeneca eCollaboration strategy? This relates both to the tools used to support collaboration, as well as enabling or inhibiting factors.

A purpose of this report is to provide tangible high-level recommendations as input to the enterprise wide AstraZeneca eCollaboration strategy, but I also see the recommendations as a contribution to a wider research community interested in computer supported collaboration in globally dispersed organisations.

1.3. Thesis disposition

Collaboration in distributed organisation discusses why eCollaboration is important, what specific issues around eCollaboration are addressed in the report, and defines a clearer research purpose.

In *Enabling collaboration between knowledge workers - a theoretical standpoint*, I present and discuss previous research on collaboration and how to enable collaboration supported by electronic means.

In *Approaching the AstraZeneca case - research methodology*, I present how I have approached the AstraZeneca case and discuss my methodological standpoints. This relates both to how data was collected and how it was processed. My methodological choices are based on both my theoretical framework and a pre-study conducted within AstraZeneca. I also present a brief background on the current eCollaboration tools in place within AstraZeneca.

In *Case study: eCollaboration in AstraZeneca,* I present information on AstraZeneca and the challenges facing the pharmaceutical industry when it comes to collaboration. I also present my findings related to eCollaboration tools and processes collected in end-

user interviews with AstraZeneca employees. This presentation is divided into three categories: tools, cognitions and structural elements.

In *Improving and enabling eCollaboration – a discussion*, I discuss my findings seen in the light of my theoretical framework and the challenges facing the pharmaceutical industry and AstraZeneca.

In *Conclusions and five key strategic messages for eCollaboration in AstraZeneca*, I summarise my findings and present five recommendations for improving collaboration between globally dispersed employees within AstraZeneca.

In *Speculating and directing further studies*, I suggest avenues for further study both in AstraZeneca in particular, but also in relation to increasing the general knowledge on how to support collaboration among globally dispersed employees.

2. Enabling collaboration between knowledge workers - a theoretical standpoint

In this chapter I present previous research on collaboration and the characteristics of collaboration and knowledge sharing. I thereafter translate this into high-level capabilities of an eCollaboration platform. What should the platform support? I then examine previous research on factors that may inhibit or stimulate usage of an eCollaboration platform. The previous research on eCollaboration capabilities and pre-requisites for successful collaboration is finally being synthesised into a framework for approaching eCollaboration.

"The most important, and indeed the truly unique, contribution of management in the 20th Century was the fifty-fold increase in the productivity of the manual worker in manufacturing. The most important contribution management needs to make in the 21st Century is similarly to increase the productivity of knowledge work and the knowledge worker."

Peter F. Drucker
(Drucker, 1999, p.79)

As management scholar Peter Drucker (1999) argues, the most important task for management in the 21 century is to improve productivity of knowledge workers. To be able to understand the predictions of Drucker and to be able to actually make that contribution we need to briefly outline what a knowledge worker is and what knowledge work consists of. Knowledge workers work primarily using their own knowledge base gained through experiences. This knowledge is further being developed when new experiences are being incorporated and valued in relation to the current knowledge base. Knowledge work can be seen in relation to the traditional labour model where emphasis was placed on the physical capital deployed in plants and machines instead of human minds (Drucker, 1999). Knowledge work is crucial to AstraZeneca, seen to the fact that the success of the company depends on how well employees deploy intellectual skills when developing, producing and selling drugs.

If knowledge workers are working primarily with information and development and use of knowledge, how is that work being conducted? A significant part of knowledge work is about communications, coordination and exchange between people. These activities can take place within a work group, within a project team, with suppliers and customers, with clerks and production workers, with managers and with people holding information that others may depend on for proceeding and fulfilling objectives. These are all activities related to exchange of information and knowledge created and held by and flowing between people. Knowledge is not a discrete object; it is embedded in people, which makes it hard to transfer. (Davis, 2002)

2.1. Collaboration is enabled by ties between people

Stanford scholar Mark Granovetter (1973) is one among an abundance of scholars trying to understand how knowledge and information are being exchanged between people. He argues that social-networking theory can shed light on knowledge sharing between individuals. Social networking theory deals with how people are linked to each other and the characteristics of the ties that bind them. The strength of a tie between two

people is a combination of several aspects such as the amount of time two people have spent together, the emotional intensity, the mutual confiding and reciprocal services that characterise the tie. Ties can be characterised as strong, weak or absent according to Granovetter. The main outcome of Granovetters work is that people with strong ties tend to have overlapping social networks, similar persons tend be interested in similar things, making it hard for strong ties to bring in new non-redundant knowledge. He further argues that weak links can play an important role for bridging strong networks as being described in figure 1 below.

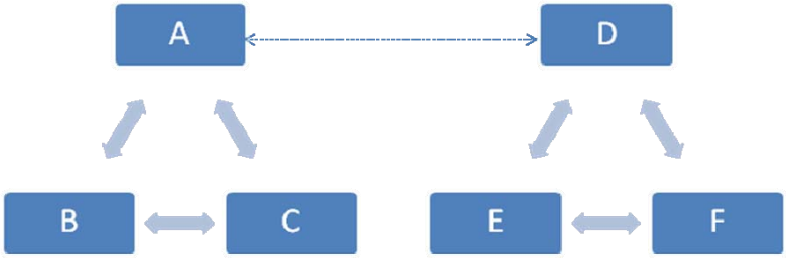

Figure 1. Strong ties networks bridged by a weak tie. (own production, after Granovetter 1973)

The theoretical framework laid by Granovetter is empirically validated by INSEAD business school professor Morten Hansen (1999) who concludes that presence of weak inter-unit ties speed up transfer of non-complex knowledge between groups of researchers. Strong ties are though being important for transfer of more complex knowledge.

The concept of ties is further elaborated on by Hansen, Mors and Lovas (2005) who suggest that weak ties can decrease search cost measured in engineering hours, when individuals or groups search for knowledge outside the group. This study also validates that complex and tacit knowledge flows faster through strong ties. This finding indicates that knowledge transfer can be decomposed into two phases; searching and evaluating knowledge and the actual transfer of knowledge.

Levin and Cross (2004) argue that weak ties provide access to non-redundant information. Their research also shows the importance of trust and ability to judge the source of the information; they complement the theory of Granovetter with another category of ties called trusted weak ties, yielding the most useful knowledge transfer of all. Best and Krueger (2006) claim that individuals more actively pursuing and maintaining weak ties typically possess greater levels of social capital than those limiting their interactions to strong ties. Social capital is built up in relationships between people and can be important when a person needs to call on resources controlled by others to solve a specific problem (Coleman 1988).

In eCollaboration these benefits could be gained using software that facilitates interaction through weak tie relations and helps to maintain weak ties. Some indications and suggestions has been brought forward that social networking sites like Facebook and MySpace might be fertile for maintaining weak ties. Granovetter states in an interview with New York Times (2007) that: “When I was 27, we didn’t have Facebook or MySpace or Friendster. These social networking sites must make people more aware

of weak ties". Finding specific empirical research in this field is not easy; research is often presented by vendors of specific tools that are intended to support social networking. This research is not currently sufficiently well developed to present here. Social networking sites have gained interest in recent years but it's still hard to find reliable studies on their effects on weak ties. Also instant messaging[1] has been mentioned as a support for maintaining and developing relations with people you don't meet very often (Dwyer 2007).

Sundgren (2007) argues that sharing of information between projects and sites, efficient re-use of previous experiences and use of know-how is an area that show low satisfaction among employees within AstraZeneca R&D. Knowing that week ties are important for knowledge sharing between groups, it seems important to pay attention to how globally distributed knowledge workers within AstraZeneca can exploit and maintain weak ties.

Harvard Business School scholar Andrew McAfee (2007) argues that it can be fertile to extend the concept of ties to include also potential ties. These are ties between people that could potentially mutually profit from having a tie, but do not currently have one. This potential is based on shared characteristics. McAfee argues that there are, most probably, a range of people in an organisation that might have intersecting areas of interest, share common problems and could benefit from exchanging information. He also argues that, in an eCollaboration context this could be facilitated using software that supports finding people with specific characteristics. He also suggests that strong, weak and potential ties may be supported using software.

Software for finding people can support and visualise links and relationships between people and provide possibilities to find others based on certain criteria. According to Huysman and Wolf (2004), there are two approaches to building and maintaining information bases that such tools could build on; an automatic approach with data mining software that collect and organise information about people, contacts and characteristics based on information in several repositories, HR-systems, publications, abstracts, information on company intranet and communication through channels such as email and instant messaging. Another approach would be to let users provide and upload their own information. Previous research in the field of locating persons with specific characteristics has mostly been focused on how to develop and maintain supporting systems, and specific studies measuring the ends of an implementation are hard to find if an unbiased view is important. Several vendors offer success stories but I find it reasonable not to include them here, since the scientific base is not sufficiently developed. Dingsoyr et al. (2005) performed a study on people location system usage in a medium-size software consulting company and found that the implemented system was beneficial for allocating resources (persons) to projects and also for short term problem solving through identification of experts. The system also brought increased long-term knowledge about expertise and where in the organisation to look for experts on specific matters. Further Gartner (2007) states that computer systems for social interaction may help people identify common points of interest which in turn may speed up and facilitate social aspects of collaboration.

[1] Instant messaging is a software for sending real-time text messages between computers. IM also provides a possibility to display an availability status, so-called presence awareness.

To conclude the discussion on links; strong, weak and potential ties are likely to play important roles for collaboration and knowledge diffusion and should be considered when discussing increasing efficiency in knowledge work. Figure 2 describes how this can be visualised seen from an individuals' perspective. Important to keep in mind is that the level of trustworthiness that collaborators attribute or are able to attribute to each other is important for the knowledge transfer process.

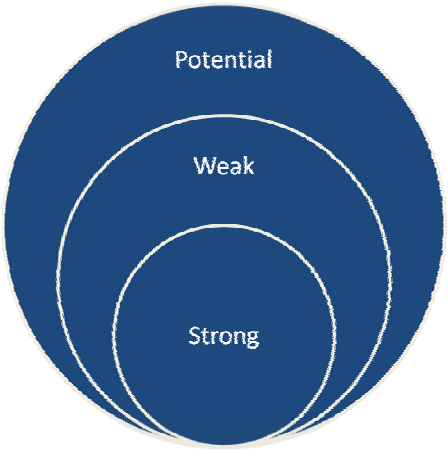

Figure 2. Strong, weak and potential ties seen from an individual knowledge worker

(Own production after McAfee, 2007)

I assume that there is no difference between knowledge workers that are co-located and knowledge workers that are dispersed when it comes to the importance of strong, weak and potential ties. However, knowledge workers that are not co-located are faced with barriers when using colligating information technology. The role of eCollaboration is to help individual knowledge workers exploit strong, weak and potential ties even if they aren't co-located.

2.2. Enablers of successful eCollaboration

Seen to the importance and characteristics of ties in knowledge work I propose that the following high-level capabilities are important. An eCollaboration platform should…

- Support collaboration and knowledge exchange between people sharing strong ties such as a team, development group, or similar.
- Support communication and knowledge exchange between people sharing weak ties. The eCollaboration platform should support maintenance and development of weak ties. Maintenance is important to emphasise since casual physical interaction is often strongly restricted when being primarily based in distributed sites.
- Promote and facilitate interaction and exchange between people that share a potential tie.

The discussion above outlines capabilities of a collaboration platform and what a collaboration platform should support and why those capabilities are relevant. But just considering capabilities in terms of tools is just not good enough. To reach a desired effect, tools must be used in an efficient way and that calls for attention both to how

different components interplay with each other but also to a number of non-technology related factors.

2.2.1. Designing tools for eCollaboration

Jonathan Grudin (1994) discusses challenges for collaboration tool designers and argues that designers both of software and usage processes must approach collaboration tools differently from how they would normally approach single-user applications, like a word processing tool for example.

Grudin identifies five challenges directly related to design of eCollaboration applications and processes.

- Work and benefit disparity. There might be a disparity when it comes to work and benefit of activities built into the collaboration system. For example, the success of a meeting management system depends on the information about availability that users enter into the system. The person benefiting from this is the person that needs to schedule a meeting, which in many cases may be project managers or persons allocating resources.
- Critical mass and prisoner's dilemma. To work together, systems and users must adopt the same standards and protocols. For example, two individuals can work individually in different word processors but when co-authoring they must use the same tool or file format. The prisoners' dilemma relates to a situation where the end result is worse for both an individual and a group if a person tries to further only its personal best interest. An example of this can be a data base with certain information, the easiest way for each individual is to freeload but if everyone does so no information would be entered and none would benefit from information sharing. Lou, Lou and Strong (2000) claim, from an empirical study of an eCollaboration tool implementation that the perceived critical mass of an eCollaboration system is having the largest effect of successful and fast adoption.
- Disruption of social and political processes. eCollaboration tools can override and connect people in a way that an organisation isn't used to and disrupt social and political processes. For example, email has lowered physical barriers for contacting persons and bespeaking them in ways that would have not been possible in face to face settings.
- Exception handling. There may be a disparity between the formal work structure and how work is really done. This must be understood when developing eCollaboration tools and processes.
- Integration with heavily used features or tools. It's important to ensure that eCollaboration tools integrate with tools that people use heavily for individual work. If tools aren't integrated and designed with usability in mind this may increase the cognitive load that users experience, making it tiring to work using a certain system. Cognitive load might also be increased when forcing users to work in many systems with non-harmonised user interfaces for example. Bullen and Benenett (1990) distinguish between different types of integration; restrictions of data flows between different systems and restrictions on how different systems function.

Fred Davis (1989) argues that adoption of technology is related both to the perceived ease of use of a system but also to the perceived usefulness of a system. How useful a tool is perceived to be doesn't only relate to specific features of a tool but also to other aspects outside the tool environment.

2.2.2. Cognitions and structural properties facilitates collaboration

Wanda Orlikowski (1992) at MIT Sloan has come to similar conclusions in research through an exploratory case study on an implementation of a new eCollaboration system in a management consulting firm. She found out that two categories of non-technology related factors affect the adoption of new eCollaboration tools, namely the cognitions people have about the system and how well structural properties of the firm interplay with the new tools implemented.

Cognitions on a system relates to how people grasp and understand the value of the system and the new ways of working. The cognitions of users are being formed by communication about new tools and processes and also by training users. How technology is being presented and perceived by users is being referred to as technological frames that people hold, in a study by Gash and Orlikowski (1994).

Structural properties of an organisation set the game pad for using collaborative tools and for how attractive users find them. This relates to the reward system in a company, policies and procedures and firm culture and working norms. Orlikowski (1992) argues that, if management support, incentives and a will to collaborate between parts of the organisation is lacking, collaboration is less likely to take place even if a suitable and highly user-friendly system is being implemented. If proper policies and procedures aren't in place when it comes to access rights, confidentiality and data quality the success of the implementation might be at risk. For any large global company it's also very important to consider having proper policies and procedures in place for legal compliant use of eCollaboration systems and for intellectual property protection. This is highly important for a company like AstraZeneca, working in the pharmaceutical industry where intellectual property disputes are commonplace and highly sensitive information related to health of patients can lead to legal disputes with large sums and reputation at stake if maltreated. Different perspectives of eCollaboration overlap each other as can be seen in figure 3.

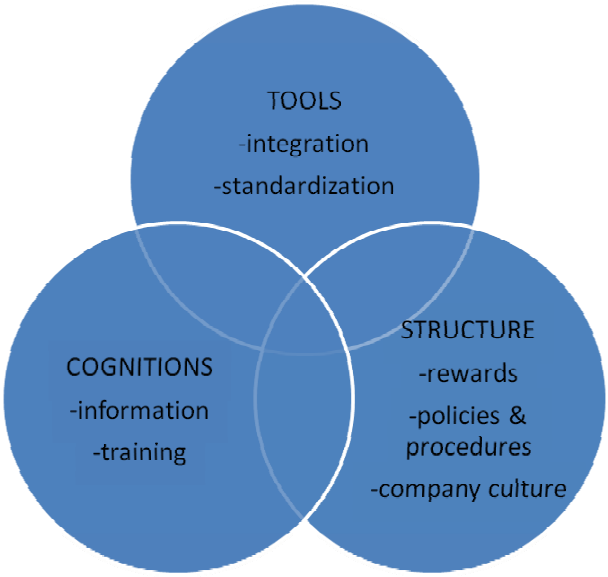

Figure 3. Overlapping characteristics of eCollaboration enablers (own production)

The constructs presented in this section will help me define research methodology and will also help categorising and analysing the findings. I summarise the key messages relevant to my study goal below.

- Strong, weak and potential ties are important for collaboration and must be taken into account when considering the building blocks of an eCollaboration platform.
- There are a number of enablers for usage of an eCollaboration platform. Tools, cognitions and structural components must be taken into account for success in the field of eCollaboration.

3. Approaching the AstraZeneca case - research methodology

In this section I present how I realized my research purpose through empirical findings made in interviews with AstraZeneca employees on different levels and from different areas of the business. Further I present how decisions were made in relation to; project planning, background information collection, choice of respondent and the interview situation. A brief outline of the eCollaboration capabilities in place in AstraZeneca is included to enable a discussion on study focus areas. In the end of this chapter I also present the criteria used to categorise, analyse and label the findings.

The data collection process of this thesis work has been carried out by a team of university students based in China, France, Sweden, UK and the US. The team work has been directed by Jens Bäckbom and Jonas Myhr collaboratively. Team leads have been tasked mainly with guiding and directing the project while team members have focused mainly on data collection in form of interviews with employees from AstraZeneca. Both team leaders have also conducted interviews with AstraZeneca employees in Sweden. The project work has been divided into three distinct phases which can be found in figure 1 below.

Pre-study	Interviews	Analysis and recommendations
• Interviews with ~30 stakeholders in the IT-field within AstraZeneca. • Recruitment and formation of the eCollaboration university team • Background study on the pharmaceutical industry • Study of the current eCollaboration situ-ation in Astra-Zeneca. • Compilation of interview guidelines and revision to adjust fit to local contexts. • Finding and selecting respondents • Scheduling interviews	• ~50 interviews, face-to-face and telephone with AstraZeneca employees based in Canada, China, France, Italy, Sweden, UK and US. • Semi-structured interview guidelines • The interviews were documented in a team wiki[2] in accordance with a specific docu-mentation framework.	• Interview findings analysed in accordance with theoretical framework. • Recommendations to AstraZeneca eCollaboration strategy based on both pre-study and interview findings. • Presentation to a large number of AstraZeneca internal stakeholders for feed-back.

Table 1. Overview of the research processes

[2] A wiki is software that allows users to create, edit, and link web pages together. Wikis are often used to create collaborative websites.

3.1. Pre-study

Since none in the research team had any substantial experience from the pharmaceutical industry we had to start addressing that deficit since our work on eCollaboration tools are to be deployed in an industry context and support AstraZeneca overall strategies. Understanding of the existing eCollaboration tools and capabilities in AstraZeneca today was also perceived as crucial for the success of the teamwork, since an interviewer needs to have a good knowledge about tools and processes that interviews are focused on. One large decision that we have been confronted with is how to delimit and define what the scope should be in relation to current collaboration tools. This question must be dealt with in order to answer my research questions on attitudes on the current capabilities. I first outline and nail down the current capabilities and what the study should focus on.

3.2. Discussion on the scope of the study

The current eCollaboration tools in place in AstraZeneca serves four distinct purposes. There are support for *e-mail and calendar sharing* for messaging and coordinating activities both internally and externally. *Collaborative workspaces* provide possibilities for distributed groups to share information within groups in a centralised fashion. *Web conferencing* tools support meetings where participants are not co-located. For finding others in the organisation there are various *people search* engines in place. These capabilities are being elaborated on with greater depth in chapter 4.2.

We decided, after initial interviews with AstraZeneca eCollaboration strategy team, to exclude email and calendar sharing from our study, since these were seen as mature standard techniques widely diffused and accepted in the company. We focused on the following current tools: collaborative workspace, web conferencing and tools for finding other people within the company. Previous studies performed internally in AstraZeneca (Sundgren, 2007) had indicated that collaboration in tighter groups were seen to function rather well but collaboration with employees not directly involved in ones specific team or group was seen as insufficient. From the pre-study and our theoretical framework we decided to investigate use of two techniques that could support collaboration between people that aren't tightly linked. The tools that we decided to collect notions and opinions about in relation to weaker links were tools not currently in place enterprise wide in AstraZeneca today, being instant messaging and wiki technology. The tools have been piloted in various parts of the organisation and have also been indicated in my theoretical framework as tools that might reduce barriers for collaboration in distributed teams. The study focus in terms of investigated tools is being displayed in figure 5.

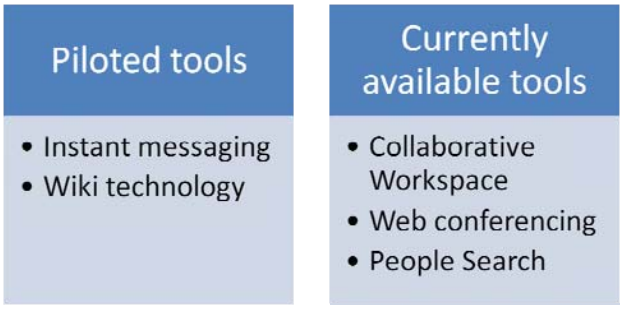

Figure 4. Figure on study focus areas in terms of collaborative tools (own production)

3.3. Developing interview guidelines

The two pre-studies on the pharmaceutical industry and current eCollaboration capabilities along with my theoretical framework has been the basis for developing interview guidelines. The interviews cover the respondents' background but focuses on attitudes and perceptions towards the current toolkit. We also involve questions in how respondents got aware of a tool, how they perceive management support and training and what their suggestions are for improvement of the eCollaboration situation.

We have also included some questions that address tools/capabilities not available enterprise wide in AstraZeneca today. This was done to catch experiences from eCollaboration in other situations, e.g. in other companies, on spare time, or un-structured previously unknown use within AstraZeneca. The interviews were conducted according to the same framework in all countries. The reason for choosing to carry out interviews was to define the basic issues around eCollaboration in AstraZeneca and to reach a comprehensive understanding of how employees perceive eCollaboration. Since no studies of this kind had been conducted earlier in AstraZeneca, this is a crucial first step for understanding and exploring the baseline. We were also interested in the challenges that users anticipate for eCollaboration in the coming years. That would be hard to delineate through a quantitative survey without having the basics in place. The interviews were semi-structured with high-level themes opened up by opening questions as can be seen in table 2.

Theme	Opening question
Background	Describe you professional background?
General feelings towards eCollaboration	Do you rely on any electronic tools for working with others?
Collaborative workspace	Do you use eRoom [a collaborative workspace] or any other system for sharing files and information with others?
Web conferencing	Do you use NetMeeting, WebEx [web conferencing tools] or any other tool for supporting non co-located meetings?
People search	Are you aware of any tool in place in AstraZeneca for finding other people?
Instant Messaging	Have you used instant messaging, in

	AstraZeneca, in other companies or at your spare time?
Anticipated challenges for collaboration	What challenges do you anticipate for collaboration in the coming five years?

Table 2. Overview of interview guidelines

Wikis is a technology included in the study focus that isn't widespread in AstraZeneca or among people in general. We therefore decided to target wiki pilot users with specific questions on adoption, diffusion, advantages and drawbacks.

My theoretical pre-study on ties gave a basic understanding of characteristics on strong, weak and potential ties. Information about how different ties are being perceived has been gathered in the interviews and in studies of piloted initiatives.

3.4. Selection of respondents

The selection of respondents faced us with unexpected challenges. Our intention was to bring in a selection of respondents from throughout the AstraZeneca business. This was for getting both comprehensiveness but also for getting legitimacy and validity to the final outcome. Further we emphasised that we didn't want to go through the existing channels provided by the IT-department in the company. If we had done so, we were afraid that we would have ended up with a selection of respondents biased from the very beginning. We also wanted a good distribution of directors, middle-management and staff to catch different attitudes at different levels. That was our intention and motto that we wanted to work from.

However, for practical reasons and a process with many people involved we faced some deviations from this model. In one business area respondents were chosen randomly from a data set including all people in that business area. In others we worked with business contacts that provided further contacts, in a snowball like manner. In France, respondents were appointed through a member of the AstraZeneca eCollaboration Strategy Team. In China, respondents were approached and selected from organisation charts with basis for selection in business areas and hierarchical level. In addition to that, in Sweden, UK and US, respondents were chosen based on recommendations from members of a business reference group involved in the AstraZeneca eCollaboration strategy initiative. We also performed four interviews with employees from the Italian branch of the company, which were recommended by a member of the business reference group mentioned above.

This selection process of respondents may imply reliability and validity issues to the research but by at least emphasising the need for respondents not clearly aligned to the IT-function I think some mitigation of such a risk has been gained. With this procedure of selecting respondents there might also be a slight bias to people that are visible and vocal in an organisation. Further, it turned out that managers are slightly over represented in the selection. However, it's important to emphasise that this process of finding interviewees was the one accepted by the persons granting us access to respondents. I do not believe that this way of selecting respondents has twisted the validity of the results too much, since we aim for comprehensiveness, many

perspectives and a broader understanding than a possibility to statistically generalize results.

Interviews have also been conducted with employees from MedImmune, a smaller company acquired by AstraZeneca in 2007. These interviews were conducted to provide insight about how other companies are eCollaborating and how eCollaboration with external partners can be approached.

3.5. Interviews and documentation in a global team

The main part of the interviews was conducted face-to-face but a minor number of interviews were conducted over telephone. We considered sending out the interview guidelines in advance to our respondents but decided not to do so based on argumentation that it might distort and bias the respondents. If knowing that we were to ask about a specific tool, one can easily check up on that tool to be able give better answers and look better. We therefore provided only basic information in advance, that we were to discuss collaboration supported by computers. Further we accentuate the importance of not preparing since we wanted an unprepared and undistorted data gathering process.

All interviews were documented in a narrative way, structured closely to the structure of the interviews. Narrating it closely to the interview guides was important to make sure that interviews conducted in different countries would be possible to follow in a similar and harmonised way. As can be easily understood, we have many possible sources that can affect the reliability of the results extracted from the interviews; different interviewers, different native languages and possibly also different ways of understanding questions based on the culture influence on perceptions. To counteract this we worked hard to develop a common view on the interviews within the team, we developed an interview guideline document together with objectives for interviews, instructions, the actual questions and how to document the interviews. We also worked hard on achieving a high level of understanding throughout the team, so that interviews weren't to become distorted by uninformed interviewers. We also accentuated that team members that were to conduct interviews in another language then the interview guides were to double-check their translations with another person with good English and local language skills. Further, team members were encouraged to record interviews to be able to re-listen and clarify.

We also restructured the interview guides slightly after initial piloting interviews in each country, where interesting and important issues where brought to the attention of the team, in terms of differences in cultural and cognitive terms.

3.6. Guiding analysis

After executing interviews I ended up with large amounts of interview results, in summary form. From this data set vital events had to be singled out to visualise connections between the findings and my theoretical framework. This was made using a classification guide, as presented in table 3, which helped me label and categorise my findings. I labelled them in accordance with my theoretical constructs presented in the theoretical discussion above.

Tool elements	Cognitive elements	Structural element
• Integration of collaboration tools with other more heavily used tools • Cognitive load caused by fragmented, non-stringent tool environment	• How were tools introduced? • Are users aware of where to find information about eCollaboration capabilities? • How is training carried out? • Do users find the training relevant? • Is the training focused on tools (buttons and clicks) or on how tools can work in the processes they are to support? • Are users hampered by other users not knowing about or how to use tools?	• Is individual or collaborative work rewarded? • Are proper information access policies in place? • Are there any issues not related directly to the tools or training, that inhibits collaborative work?

Table 3. Overview of analysis guide

Technology and cognition components are relatively easy to approach with straight forward questions. Structural elements like firm culture and norms are harder to address but were often mentioned when respondents were asked about issues related to usage, or challenges for collaboration.

Analysing and understanding strong, weak and potential ties and their importance for collaboration within the AstraZeneca context has been done in a larger milieu and in a more multi-faceted way then approaching barriers for collaboration. Ties have been addressed both in the interviews but also in closer investigation and use of current and piloted eCollaboration tools.

The high-level questions that I have employed to understand ties are the following.

- Is collaboration in smaller groups with strong ties supported by the eCollaboration platform in place today?
- Are there specific support for maintaining, exploiting and developing weak ties in the current eCollaboration platform?
- Is exploitation of potential ties important to AstraZeneca employees?
- Is exploitation of potential ties supported in the current eCollaboration platform?

4. Case study: eCollaboration in AstraZeneca

In this chapter I present a short introduction to AstraZeneca and to the changes that are affecting the pharmaceutical industry. After this brief introduction to AstraZeneca I move on to my core subject, the eCollaboration capabilities in AstraZeneca today where I first outline current capabilities. I then present user attitudes and perceptions on the current platform, how information and training is perceived and finish with a report on how users perceive the structural support for eCollaboration.

4.1. AstraZeneca and changes in the pharmaceutical industry

AstraZeneca was founded 1999 through a merger of the Swedish pharmaceutical giant Astra and the British pharmaceutical and chemistry giant Zeneca. AstraZeneca has approximately 67 000 employees and are specialised in developing, producing and selling prescription medicines. The key activities in recent years have been the acquisition of Cambridge Antibody Technology (CAT) in 2006 and in 2007. R&D in AstraZeneca is located mainly in three major R&D facilities in the UK, US and Sweden. In recent years AstraZeneca has also founded research facilities in China and in India.

I present the pharmaceutical value chain in figure 6 and the changes that are currently in progress in the industry in table 4 below.

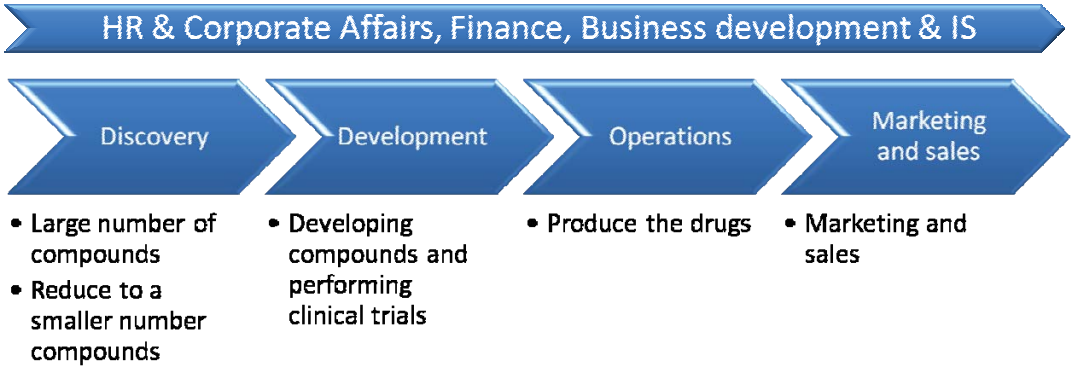

Figure 5. Generic model of the value chain in a pharmaceutical company (own production inspired by Castner et al (2007).

Even if the model seams linear, that is mostly for showing an overview of the process of developing a drug, from early discovery to marketing and sales. In this process there is ongoing cross-collaboration between different functional departments to determine market value of new compounds and to be able to determine which compounds to go

forward with. Different local geographic markets show different characteristics when it comes to market leading drugs, regulatory demands and receptivity of new drugs. This information needs to be fed into early clinical trials for. Therefore collaboration with experts at local markets are utterly important while keeping a global scale and preparing for production of drugs in the company internal facilities.

Looking even further ahead in time, the development model with the whole value chain from discovery to marketing and sales within one company might not be possible to sustain. It's not unreasonable to expect that parts of the value chain could be outsourced in a few years time. That would call for an even greater attention paid to how collaboration with external parties should take place. The whole pharmaceutical industry, AstraZeneca included, is under pressure at the current state with thinner product pipelines and rampaging cost of R&D to replace outgoing patents. This calls for increased cost focus, where also budgets for travel may come under scrutiny. eCollaboration may play an important role also for mitigating negative aspects of decreased travel budgets. Table 4 presents opportunities and threats facing the pharmaceutical industry in general and therefore also AstraZeneca.

Opportunities	Threats
• Aging world population. Elders tend to consume more drugs than younger people. • Emerging markets like China, India, Brazil and Mexico have a population growing richer. A richer population tend to get more welfare diseases due to changing nutritional patterns. • Outsourcing and off-shoring to low cost markets also of R&D and more advanced production facilities. • Shared development and marketing and sales projects with external partners for lower risk and lower cost.	• Changing prescribing authority for physicians. Government agencies and insurance companies playing an increasingly important role for what drugs to prescribe due to rampaging health costs. Who is the customer for the pharmaceutical companies? • Bad reputation. How can high prices be justified? Increasing focus on performance in relation to price. • Thinner pipelines leading to less new blockbusters replacing old ones. • Generic erosion of pipelines when drugs going of patent are being replaced by low cost generic drugs from other new companies. • Increased competition from new players emerging in the newly industrialised world • Challenging to learn new markets and collaborate in new cultural contexts.

Table 4. Overview of opportunities and threats for companies operating in the pharmaceutical industry

Looking both at the value chain of pharmaceutical companies and the opportunities and threats presented above one can argue that eCollaboration may play an even more important role in the coming years.

- A need for earlier commercialisation of drugs to increase product life-cycles and mitigate generic erosion will call for increased collaboration between different parts of a company internal value chain. Parts that may be geographically dispersed.
- Increased collaboration with external partners due to out-sourcing, acquisitions or shared development projects calls for attention on how eCollaboration can be conducted with external partners.
- Emerging markets will increase in importance both as markets and as a base for R&D. This calls for increased focus on how eCollaboration in new cultural fields can be supported.

All factors above call for an increased focus on the eCollaboration capabilities AstraZeneca have in place and how well eCollaboration is AstraZeneca employees are supported by tools and adjacent factors like cognitions and structural elements.

4.2. The current eCollaboration tools in use at AstraZeneca

The collection of collaboration tools in AstraZeneca is hard to distinguish and nail down exactly due to a tradition of high decision autonomy in various parts of the company. This has caused a situation where the collection of eCollaboration tools is hard to overlook. Below is a presentation of the tools that are centrally provided and available on a global scale and not only in a distinctive part of the organisation as a department or local market company.

4.2.1. Collaborative workspace

A collaborative workspace is an environment where distributed or co-located users can access information, files and interact with each other in an asynchronous way. AstraZeneca is a project driven organisation and collaborative workspaces are often set up to support distributed team work. The global standard tool that provides such an environment to users throughout AstraZeneca is called Documentum eRoom and is delivered by a vendor called EMC. The software is hosted inside AstraZeneca network for use of AstraZeneca internal users. There is also a possibility to set up external eRooms where external parties (situated outside the AstraZeneca network) can access project information and collaborate. To access external eRooms, users have to login using a two-factor authentication, using a specific code generating box, which creates a barrier for external collaboration. eRoom provides limited integration with other tools such as Microsoft Office and Windows through downloading of a plug-in.

Shared network drives are present throughout the company and provide a possibility to share files in a single repository. Shared drives are more suitable for large files since eRooms have a restriction on file size and also on total size per eRoom. Network drives appear and interact with a person's computer much in the same way as an individual hard drive does.

During my studies I have also come across a range of different collaborative workspaces throughout the organisation. Among them Microsoft Sharepoint implementations can be found in France and in MedImmune. A system for collaborative workspaces called LiveLink from the OpenText Corporation is present in the Italian market company.

4.2.2. Web conferencing

Web conferencing tools are a support for synchronous meetings where users normally aren't co-located. Tools can though also facilitate meetings with a large number of co-located participants. The tools support sharing of applications, such as PowerPoint slides or other desktop applications. The visual part of meetings is supported by web conferencing software while the audio part is supported by conference calls via the regular telephony network. There are two centrally supported web conferencing tools in place in AstraZeneca today. Microsoft NetMeeting 3.0 which is used for collaboration between people situated inside the AstraZeneca network. NetMeeting 3.0 is recommended to include maximum five participants in meetings. NetMeeting is included and delivered with the operating system available on the standard AstraZeneca PC clients running Microsoft Windows 2000. NetMeeting provides some integration with other Microsoft tools such as Microsoft Outlook that is being used for scheduling meetings and appointments. There is also an address book available where users that are online at NetMeeting show up. Only users in Sweden, UK, US and the Asia-Pacific region show up in the address book though.

For computer supported meetings with a larger number of participants than five but smaller than 350 AstraZeneca employees can sign up for a web based service from a company called WebEx. WebEx is a part of Cisco systems since May 2007 and does also provide a way for AstraZeneca employees to conduct web meetings with parties sitting outside the AstraZeneca network. This is important when collaborating or communicating with external partners such as contractors, potential employees and other stakeholders. WebEx meeting data transfer is encrypted using Secure Socket Layer from end-to-end participant and no data is being persistently stored at WebEx servers. For accessing a meeting a user have to be invited and receive a specific meeting number and a specific password for each meeting. This might be considered as the weak point of this system since meeting invitations are often sent in un-encrypted email messages that can be wiretapped. There is no integration between AstraZeneca people directories for facilitating invitation of participants to meetings. Inviting meeting participants are therefore done by copying information from the WebEx interface to the meeting invitations interface in Microsoft Outlook. During my studies I have also come across use of a system for web conferences and online meetings called Centra which is available in the Italian market company.

4.2.3. People search

For finding others to collaborate with there is an AstraZeneca global address list (GAL) in place. All persons having an AstraZeneca email account are present in this list. This means both AstraZeneca employees and some external contractors holding AstraZeneca email addresses. Also MedImmune employees are present. The GAL provides some basic information on each employee such as name, e-mail address, address and phone number. The list often provides some notions on title and belonging in the organisation.

For searching in this list one has to have some notion on a person's name. Searching for "myh" displays for example "myhr", but also a collection of other names starting with "myh". Information in the GAL is provided by a number of back-end systems. There are also two different people search functions on the company intranet, providing richer information than the GAL. One of them provides richer information when it comes to memberships in different collaborative workspaces and provides also a possibility to enter personal information in free text on interests, skills and provides a possibility of adding photos etc. The other function provides a possibility to display titles for example. There are also some indications about possibilities to search for skills based on a fixed taxonomy but there are only a small number of people who have inserted their skills in this system.

The basic capabilities of the tools in place today cover both synchronous and asynchronous collaboration as well as a basic possibility for finding people.

Figure 6. Current eCollaboration tools in AstraZeneca (own production)

Figure 4 displays the centrally provided and globally consistent collaboration platform of today. In addition to these tools there is also a number of overlapping local eCollaboration tools, as mentioned, and in addition to this there are also a range of eCollaboration pilots and experiments in place. The extent and range of these tools are hard to get an overview of. There is no central point where permission has to be granted and budget fragmentation allows initiatives stemming from different parts of the organisation to move forward with low coordination.

4.3. Attitudes on current tools and processes

To be able to determine what areas to focus on and how collaboration can be improved it's utterly important to have a good understanding of the current situation on eCollaboration in the company. The empirical material that the presentation below is based on stems from interviews with AstraZeneca employees from the selection presented above. To maintain anonymity, names, titles and organisational belonging has been excluded in most case. In some cases I present extra information about respondents when a larger context is necessary for understanding a statement.

4.3.1. Collaborative workspaces

The respondents appreciate the collaborative workspaces, mainly for being able to share files with a group in an ordered fashion, where one of our respondents state that: "we can collaborate and work on the exact same file using the workspace… I've had other

experiences when we used email. We kept confusing the versions, who had the latest updated file?"
In addition to consistency and version control the workspaces adds extra functions as sending notifications about updates for example, which seems to be appreciated. Another respondent states that "I also like the alert function that tells me when to check out the new changes".

When looking at the technology factors related to workspaces the main barriers for use relates to integration with operating system and other commonly used tools like word processors, email clients and calendar applications. To some extent, end-users are comparing use of collaborative workspaces to other ways of managing documents and information, such as their own hard drive or shared networks drive that used to be standard for sharing files over a network.
A respondent state that "file copy and paste is much easier using a shared drive, compared to uploading and downloading files in eRoom" Work on shared drives and on the personal hard drive is very similar since both show integration with other workplace application such as email and word processing. Another respondent requests "much better integration with Outlook [an email and calendaring tool]. I would like to be able to initiate a meeting or another action related to a file directly from the eRoom".

Looking to the fact that the current workspace solution is an additional information container and that it's not well integrated with other tools makes it not surprising that confessions like the following are being displayed: "I appreciate the regular shared drives. They allow me to manage directories in the way I'm used to and they doesn't require me to open an extra window and do many extra clicks. I use workspaces the less I can."

As stated above there are several collaborative workspace platforms in place in AstraZeneca of today that users have to navigate between. A local market respondent describes that he is not very familiar with the tools used on a global level because he uses them only occasionally and normally uses another local system from another vendor. Another respondent working in another local market relates that he sometimes has a hard time distinguishing which files is on which system stating that: "Some departments use eRoom and others don't. That makes it hard for me to find files and it also makes it hard for me to know where I should up-load files"

Another technical issue relates to the search capabilities of the current collaborative workspaces. A respondent compares finding what you look for in an eRoom as "finding a needle in a haystack". According to a set of other respondents this is a widespread problem that is not only caused by the technical features of the collaborative workspaces but on how files and other content are being structured by the users. According to respondents different project managers tend to structure eRooms in different ways in different projects making it hard to understand and get a hold of the structure and making it hard to know where to look for different things. A respondent states that "[eRooms] are good in the beginning but tends to grow out of hand after a while". Other respondents confirm this. Another respondent states that "it's like with any other storage system. It's easy to set up but hard to maintain". Further one respondent states that workspaces lack good descriptions and that there are too many work spaces. "It's hard to get an overview of content and it's impossible to find anything unless you know exactly what you're looking for".

Another issue raised by several respondents is the processes of getting or granting access to information in different work spaces. A respondent states that "Access rights are causing me trouble, I would like to get easy access also to other workspaces to compare practise and transfer knowledge between projects".

According to a respondent, another reason for workspaces growing out of hand is that there is no good way of knowing how to treat files and information that might be old or useless in the actual context.

As a final remark and for a better understanding of the adoption and attitudes towards collaborative workspaces in AstraZeneca it's worth to emphasize that there has been no enterprise wide strategy for eCollaboration or collaborative workspaces in place and that it might have gotten effects similar to the one expressed by a respondent in R&D in AstraZeneca:
"First we had FreeCam, then OurDiscovery, [early forms of collaborative workspaces] and now eRoom, the systems [for sharing files and information] come and go but the shared drives remain the same. We need a more stable solution that we really learn to use efficiently".

Since internet connections are not ubiquitous, respondents also emphasise the need for good offline capabilities.

4.3.2. Web conferencing

The users appreciate web conferencing tools since it brings an extra dimension to telephone calls. A vice president explains that his employees are based in Wilmington, US, Södertälje, Sweden and Montreal, Canada. With NetMeeting it's possible to complement phone conferences with presentations when having scheduled meetings. Further NetMeeting can be used for reaching staff that normally would have to travel to AstraZeneca sites. This is the case for sales representatives that normally have responsibility for a sales region that can be located far away from the headquarters. A respondent concludes that it is easier to show a problem or an issue by sharing screens instead of trying to describe it only via telephone. WebEx brings similar capabilities but is being used more for scheduled collaboration with external parties, while NetMeeting is appreciated for being easy to set up and supports spontaneous use. A respondent tells that she sometimes when discussing things over the phone pops up a NetMeeting to spontaneously show figures or number that needs to be clarified.

The problems related to NetMeeting as reported by our respondents relates mainly to the process of setting up meetings. A number of respondents report that it always takes 10-15 minutes before a meeting can start if more then two people are involved.
When starting a NetMeeting everyone has to dial other persons IP-number to connect, just like a telephone call. There are no good ways of sharing IP-numbers then to read them out loud in the telephone call or share them in emails. IP-numbers in sockets in offices, open-plan offices and in meeting rooms are not always the same and this brings confusion to some of the respondents, when trying to schedule meetings and sharing IP-numbers in advance. This can be disruptive according to one of our respondents, a group manager that often hosts meetings "when starting up a NetMeeting, you normally have to repeat the IP number 100 times when people drop in". Another respondent state that setting up NetMeetings are "…a disaster, we use valuable meeting time to just start

up the meetings and the process is often very disruptive". Respondents also relates that there is an option to invite people from picking their names in an address book, though some of the respondents tells us that there are only place for individuals from UK, US, Sweden and Asia-Pacific in the address book and that people show up in the address book somewhat arbitrarily.
Further respondents state that everyone in a meeting has to accept all incoming request from new joiners. This process is also burdensome and time consuming according to users.

WebEx has similar drawbacks according to end-users. The process of setting up a meeting is cumbersome with a nine step scheduling process for example. WebEx is not well integrated with AstraZeneca People Directory for inviting people to web conferences and meetings can't be easily inserted into Outlook calendars for example. A project assistant states that "it's not convenient to schedule WebEx meetings; I can use NetMeeting whenever I want to". Another respondent reveals that "It's nice and easy to attend WebEx presentations but when I was to host a meeting myself I had huge problems setting it up".

Seeing that both NetMeeting and WebEx bring similar capabilities it's not surprising that users doesn't have full understanding of what to use when and for what. A respondent states that "I use both tools, some people prefer WebEx, and therefore I use whatever they want to". This is being done without distinction on actually tool capabilities and cost. WebEx meetings are being charged while NetMeeting is an internal tool that is less expensive.

4.3.3. People search tools

In a company like AstraZeneca people interact with and work together with others to accomplish their tasks at hand. Finding the right people for getting right and timely input to a work process is therefore seen as very important by our respondents.

Respondents in all countries state that the systems for finding people are too basic and that they do not provide more information than a basic phone directory where you have to know the exact spelling of a persons name to be able to find the phone number of a person. When asked about the current situation around people search tools the respondents present various opinions on the tools.

A vice president states that the problem of finding people is not as evident for him since he has a personal assistant that can help him search for people. But others state that finding a person responsible for a specific task depends on your personal network and a sometimes cumbersome investigation process. Another vice president states that he normally uses a ladder approach to find a specific person starting from the top. He admits though that this way forward is mainly possible for him as having reached a high level in the organisation.

Another manager states that "as a leader I always get asked, do you know anyone who can do this? Who has the right skills? I usually say that there was somebody but I find it difficult to locate them."

Other respondents emphasise the social component of an application for finding people. A respondent states that "seeing a person's professional resume would be helpful when

preparing for meetings with new contacts in new projects". Another respondent emphasise the need of having photos to be able to determine gender since that sometimes can be hard when dealing with names in a foreign language.

A respondent states that "It is always useful to see what people have done before, in order to find common areas of interest. It makes it easier to connect with people."

Other respondents emphasises the importance of understanding the chain of command and how different people relate to each other in the organisation. Another respondent states that "what are missing today are good organisational charts and knowledge about the formal relation between people in the organisation". Another manager states that information about who a person's manager is would be important to see how one is related to a person.

One further issue raised by a respondent is that the People Search interface is hidden down in the page structure at the AstraZeneca intranet site and that few people have added personal information in the database. This makes in unattractive and burdensome to access this tool.

The global aspects of the AstraZeneca business become visible when dealing with international aspects of the current People Search tools. A Chinese respondent reports that it can be hard to distinguish between name and surname in international contexts "My name is X Y in Chinese but people tend to send my emails to a person with an inverted name Y X since there is no good way of distinguishing between people". Another Chinese respondents reports that job titles sometimes shows up only in local languages like Swedish or French which is not comprehensible to people who doesn't speak the specific language.

Another respondent brings up the challenges that AstraZeneca is facing in relation to collaboration with external partner and mentions the acquisition and collaboration with MedImmune as a case where it could be valuable to also get details on external partners that you need to collaborate with. In the current state MedImmune employees are visible in the Global Address List supplied through Microsoft Outlook, but they are not visible from the other two central people search functions, White Pages and Skills directory.

As mentioned above finding people is important. Therefore it's not surprising that some of the employees take own actions to fill the gaps that the institutionalised applications can't bridge in their current state. A wiki initiated in the R&D parts of AstraZeneca gathers a growing number of people, today around 175 persons, and offers a possibility for users to insert and edit their own personal information in terms of photos, educational background, previous work experience and research interests. This is an approach that shares information about people with others. In our case study we have also come across individuals that has been forced to gather and compile own information about people and their responsibilities. A respondent told us that he has been forced to spend time researching and compiling his own Excel spread sheets for keeping track of people in the IT-department responsible for systems that he has to interact with for communicating demands and requests.

One of our respondents in China states that they have specific Excel spread sheets that contain information about people and responsibilities that one can download from the Chinese intranet website.

A director in the French market company reports that she depends on a confidential set of organisation charts for navigating in the organisation and for finding the right persons. She relates further that she has gotten access to the charts due to her rank in the company and that they are not available to all employees.

4.4. Piloted tools for improving collaboration

AstraZeneca has traditionally been a decentralised organisation with a fragmented resource allocation. This has led to a situation where also a number of non-official and non-centrally provided applications are being in use in different parts of the organisation. Some of these applications address issues with collaboration that have been indicated as being problems in distributed organisations in general and in AstraZeneca in particular seen from our theoretical framework and we therefore see a great value in including them in our report. The different applications below stem from grass root initiatives and are therefore not integrated with other more frequently used tools and are not subject to any specific central policies on usage. Naturally there are no centrally developed training materials available.

4.4.1. Wiki technology

Information sharing and effective re-use of knowledge have been reported as being problematic in AstraZeneca, as mentioned in the theoretical framework. The collaborative workspaces in place don't provide a good overview and it's hard to find information unless you know exactly what you are looking for. Scientists in the R&D parts of AstraZeneca have therefore started to explore usage of software called wiki for addressing the shortcomings of the collaborative workspaces in place today. A wiki is a software that allows users to create, edit and link web pages easily to build, maintain and develop collections of websites containing collaboratively developed information. In the beginning a wiki contains nothing but a blank web page and all pages have to be created by users. The difference between normal intranets for example is the possibility to easily edit and update the pages. There are a small, approximately 10 but growing number of wiki pockets in place in AstraZeneca today and we have gathered information on some of them. Since they all have emerged from grass root initiatives the efforts have not been coordinated and no clear central policies, procedures or common approaches to technology exists. Still, they underlying concept of wikis is the same.

According to one of our respondents who is a team leader in R&D, and part of a wiki initiative, a main benefit of wikis is that they give a much better overview of content compared to workspaces and shared drives that tend to be centred around computer files. "Before, people typically had an idea about something, did some analyses and the results ended up in a PowerPoint that nobody read". The respondent states further that this is something that the organisation intended to mitigate with help of wikis stating that "Wikis will make us better at not re-inventing the wheel all the time and it forces people to think before they act". In addition to creating an overview and enabling sharing between projects of what's going on in the specific business unit, wikis can also

serve as a possible good application for introducing new employees; “The wiki provides learning for new hires, who can easily get introduced to what is going on”.

This seems to be a successful wiki implementation according to a respondent that states “the wiki now contains updated information about 50% of the company’s projects [in a confidential area]”.

The main problems with wikis according to both end users and IT-professionals within the company relate not so much to the wiki technology itself but to structural components and how wikis are being configured.

- Access rights – who should have access to what in the wiki and who should be able to edit which pages?
- Usability – can be an issue when it comes to learning how to use a wiki. Some wikis have an easy-to-learn graphical interface while others require an amount of HTML[3]-literacy to work.
- Reaching a critical mass of users that contributes is important according to respondents. One respondent state that the use of wikis didn’t really took off until more senior managers took a larger stake in the project and started to push for usage. “All projects in [a confidential area] the UK are using it, and their managers are enforcing it as well”.

4.4.2. Instant messaging

In our research we also picked up non-central and un-supported usage of instant messaging clients. Instant messaging offers synchronous text-based conversations in a format akin to real conversations than the more formal letter format of emails. In addition most instant messaging clients also provide possibilities to see and determine availability for communication with different individuals (Wikipedia, 2008). I see instant messaging as interesting in relation to globally distributed organisations since collaboration may be restricted due to an uncertainty on availability and the barrier for collaboration that time and space brings. I also see a risk of members getting a feeling of isolation and non-belonging in distributed teams, which could be mitigated by increasing the visibility and lowering the barriers for interaction.

According to users of instant messaging systems in AstraZeneca the main benefits from having instant messaging clients would be two directional including both the possibility to discuss and clarify smaller questions but also the possibility to have get information about a persons’ availability. A respondent working in a global project states that; “I get more useful after-hours due to the presence functionality. You can see if someone is still in the office if you need a quick answer. That saves a lot of time”. Another respondent states that “I can check a person's availability by telling if he/she is online while emails don't have the function”. Further another respondent validates the possible usage of instant messaging for clarifying minor issues as: “This [Instant Messaging] would be good and could be used for communication for example when you are not really exchanging any information but more want to clarify something or ask a quick question”

[3] HTML is a text-language for structuring websites.

The views above stem from a number of people among our respondents who has tried instant messaging within AstraZeneca, in other companies or in their spare time. It's important though to point out that they are not a majority of employees in AstraZeneca and that a number of people who has not tried instant messaging has shown sceptical views on the subject calling instant messaging disruptive, unproductive and intrusive. A manager that hasn't used instant messaging states that it might be intrusive: "With email you can work in your own pace and decide for yourself when you want to respond to something… if people can see that I'm online it's just like me not owning my own time any longer. It would probably be stressful if people would expect immediate responses".

A vice president state that instant messaging might be disruptive "What if I'm busy working with the budget and have a deadline upcoming and some message pops up, I would go mad". Other respondents indicate that records retention and management of conversations is important both when it comes to email and instant messaging. A scientist that uses an instant messaging client in her work today states that: "I want to be able to save and retrieve information, for that email is better". Even though many respondents state that instant messaging could be beneficial there are respondents having qualms about instant messaging being a time-consuming toy where AstraZeneca employees would let their days drift by socialising. Though, one should maybe not underestimate the power of socialising and maintaining contacts via instant messaging. One respondent stated that "the barrier of distance weakens my feeling of belonging to a group. If we have MSN [a commercial instant messaging client from Microsoft], it will be much easier to communicate."

4.5. Cognitions on eCollaboration

The material collected related to cognitions will be presented as an integrated overview and not in detail specified in relation to different technologies or procedures. Following my theoretical framework, this section elaborates on findings related to information and training.

4.5.1. Information

When compiling the interview results on information about eCollaboration capabilities in AstraZeneca there are a few themes that emerge. What can be seen from the answers from all the respondents is that there is low consistency between how the users are being informed about eCollaboration capabilities. The important themes that emerge are though;

Several users relate that they have come across the tool in contact with other colleagues internally or when collaborating with external partners such as vendors. When being influenced by internal colleagues there are respondents claiming that inspiration and pressure often come from the R&D parts of the company but also in R&D there is no consistent view on communication about new tools. Since much of the activities in AstraZeneca are based on activities in the R&D parts there is cross-functional collaboration in place that seems to be helpful for spreading the use of eCollaboration capabilities.

A respondent active in marketing and sales who often interacts with scientists from the R&D organisation states that "someone from R&D told me about NetMeeting in connection to a meeting, now I use it a lot and find it being a great way of sharing information. I even propose to others that we should use it"

Similar experiences are being conveyed from a respondent working in another cross functional department, namely finance who recount the following about how he got to know about eRoom. “I got to know about eRoom from a contact in R&D, maybe 3-4 years ago. It looked interesting and useful and I invited the person to our site and we later on requested our first eRoom”.
Another respondent working in the finance function relates that “I got a 1 hour introduction by a co-worker who told me about the features of the program”.
But also respondents in the R&D department reports about inconsistent and insufficient information about tools. A respondent told us that: "It seemed to me like the roll-out of eRoom was unofficial. I got to know about it by coincidence, and it lived parallel lives with OurDiscovery [an earlier form of collaborative workspace] for a while."

There is low consistency when it comes to how users would go by finding information about collaboration capabilities but most users tend to claim starting in their close proximity with colleagues in the first hand. Other indicated ways of searching for information about collaboration capabilities are intranet sites and calling help desk.
Both of these two options are though regarded as inferior. When we asked a respondent about how he learned to use NetMeeting he stated that: “I downloaded a manual on the intranet and browsed it through, if I was to find the same manual today I don’t think that I would find it, the intranet in general and the search capabilities has gotten out of hand”
Another respondent refers to help desk in the following way: “You know, Helpdesk is only useful when something is broken or has gone wrong [and not for asking questions about usage]”.

The effects of inconsistent and inferior information can be lower usage since a critical mass is harder to reach. A respondent working in R&D states that: “I find that on a number of occasions I cannot use eRoom, as some people do not understand how it works, this is down to two reasons, either they have never heard of the software or they have not been trained efficiently”. Another respondent attributes part of this gap between people to a gap between generations where younger people tend to be savvier in learning how to use new technologies.

Information and training can be hard to divide in a rigorous manner but questions about training convey more answers on how end-users have been thought to understand and work with different eCollaboration tools.

4.5.2. Training

Seen from our interview results there are no clear and evident emerging patterns in terms of how training is being conducted. This is reasonable though seen to the fact that budgets for training on collaboration tools shows a fragmented resource allocation, both when it comes to the specific training cost but also seen to the cost of using valuable working time for training. However, a few interesting observations can be made, looking at how the specific training is carried out but also regarding the effects of insufficient training.

Training on using tools is being carried out in a number of ways. Our respondents report participation in classroom training, e-learning activities, personal training with consultants from external companies, peer-to-peer training and finding out on their own how to use certain tools. The specific content in various training sessions has been hard to uncover due to the fragmentised environment. Training has been mostly focused on

tool specific functions and not so much on the work processes that the tool is to support. In relation to training a user of eRoom states that "Yes I have gotten sufficient training on how to use the tools. However in the beginning of a project I think that all project members should understand how eRooms are structured and where you post the right things. This also relates to distributed meetings, people should get more training on how to participate in distributed meetings then on the technical part". Also another respondent emphasises similar needs in terms of training "… it's not a technical training that is most needed but more a training on how to use collaborative spaces efficiently. What do you use it for and what is best practise on sharing documents etc. The training should also give people a reason for using the new tool and show benefits of using it".

Looking to the need for training material and where to find it, other respondents emphasise the need of training material in relation to learning on ones own. "If there's new software launched in the company, I'll have a look and try. But if they don't have any training material, I would not start to use the new software. It's time consuming to learn software ourselves, and we've other responsibilities in the company too."

Looking to the effects of training and information; a manager often hosting meetings, states that "technology is the barrier. Some of my colleagues are not familiar with NetMeeting, which will waste the time of the rest of the people [attending a distributed meeting]". This can according to another respondent be caused by insufficient training of newly hired colleagues. The respondent states that "one of our most common problems is that when the turnover in R&D [in China] is high, some new colleagues are not familiar with the tools". To round off on cognitions some respondents has emphasised the need for a less complex collaboration environment, with less tools to navigate and more user-friendly and integrated tools instead of larger resources placed on information and training.

4.6. Structural aspects of eCollaboration

Some organisational aspects of eCollaboration has already been brought forward in this report, when it comes to lack of structural policies and procedure for usage of specific tools like collaborative workspaces and web conferencing tools. As presented above, use of collaborative tools calls for a structured approach with policies and procedures in place when it comes to organising, for example content and access rights. Other aspects related to how eCollaboration is being supported by organisational structures has also been presented by our respondents, and I will further elaborate on them below.

The structural components are important for enabling eCollaboration in specific but also for ordinary face-to-face collaboration. Many aspects of structural components are related to cognitions and tools, and are not easy to distinguish from each other. Taking a starting-point in my theoretical framework I have distinguished three different categories of constructs, namely

- Management support and incentives for collaboration
- Policies, procedures and agreements enabling collaboration
- A collaborative working culture and norms that support collaboration

Management support and incentives for collaboration are important from several perspectives. Managers can provide direction and steering that enables collaboration but

can also make room for training and investments in collaborative technologies. Different perspectives of management support and incentives have been provided by respondents. As argued above, AstraZeneca will face harder economic times in the coming years, due to a harder competition and a need to canalise funds into new projects and products aimed at replacing products with expiring patents.

Finding time for training and understanding collaborative work practises might prove to be hard during such circumstances. A respondent reports that "when it comes to training, it's all about finding the time for it". How managers weigh eCollaboration initiatives in relation to other initiatives will be important for the future success of eCollaboration. A vice president in the R&D parts of company, states, after being asked about his attitudes towards instant messaging, that: "I want my people on the bench to be focused on doing experiments and not spending their time sending messages back and forth". Another manager working in the marketing organisation of AstraZeneca relates that, when being asked to outline major obstacles for collaboration that: "We are anticipating a staff cut on about 50% in the coming years, how do we maintain a collaborative environment? People might become territorial and competitive instead of collaborative." Parts of the answers to that mind tickler lays probably in the field of management support and providing the right incentives for collaboration.

Other respondents emphasise the need for management support when new tools and procedures are being implemented. One respondent refers to old experiences when MS Outlook was introduced for sharing calendars and organizing time tables. "Collaborative workspaces are new to us; they make work more efficient and should be used more. It's like Outlook and agendas in the beginning, people wouldn't use it until the direction told them to."

Policies, procedures and agreements enabling collaboration provide a frame in which collaboration and eCollaboration can take place. A number of respondents emphasise this as being highly important for being efficient when collaborating in distributed teams. A respondent relates that "structure and discipline becomes very important in distributed teams. Knowing where and when to find agendas for meetings and having well structured distributed meetings is important when having only a few hours of overlapping working time". Another respondent relates that a common problem when working in global teams is that "we mislead each other by using different names for the same things".

A respondent working in R&D states that technology is not a large issue as long as you have agreed on using the same tools. "It works well if you have agreed on using certain tools. For instance, when we worked together with Mölndal [a Swedish site], they tended to use their own shared drives [instead of eRoom] that we didn't have access to".

A collaborative working culture and norms that support collaboration is a challenge to achieve seen to the challenges that faces AstraZeneca, both in terms of a harder cost situation but also in terms of global collaboration between people from different cultural backgrounds etc. A Chinese respondent states that she doesn't find it "fair for the Chinese colleagues. We always have to stay very late for having meetings with the US." The time difference between Shanghai, on the east coast of China and the East Coast of the US is 12 hours. Overcoming such issues and working for a fair collaboration culture

is probably crucial to AstraZeneca also seen to increased importance of other emerging markets. Finding a common norm in a company that is changing is probably also a challenge that might hamper collaboration.

Another important issue that respondents have brought up is what information sharing culture is evident in the company of today. A respondent working in R&D: “It’s perceived by some people that it’s power to keep information on your hard drive and people perceive it as important in which order others receive the information.” Moving from individual work on individual hard drives to submitting information that you let others work from and build new knowledge on is different and challenging, and requires a change of mindset.

5. Improving and enabling eCollaboration – a discussion

In this chapter I link and discuss my empirical findings in relation to the theoretical framework presented earlier in the report. I first discuss the factors that may inhibit or stimulate users to adopt and use eCollaboration tools. I then continue discussing and outlining the capabilities that needs to be in place to support eCollaboration between employees sharing strong, weak or potential ties. I also discuss validity issues around approaching collaboration from a ties perspective.

5.1. Enabling eCollaboration by not looking solely at technology and tools

The discussion below follows the same structure as my theoretical framework, treating successful eCollaboration as consisting of tools, cognitions and structural properties of the situation in which the eCollaboration takes place.

The eCollaboration capabilities in place in AstraZeneca today are invaluable to many AstraZeneca employees that depend on information and knowledge held by people based on other locations. This distributed way of working is relatively new and is powered by the evolution of computers and computer networks that enable multi-modal ways of collaboration and communication. To some extent though it seems like the technology may have evolved faster than the cognitive and structural models that enables use of collaborative technology. One probable reason is that this might be caused by the more tangible characteristics of tools in relation to investments in cognitive or organisational capabilities. Another reason that I see is that tools have traditionally been delivered by the IT-organisation while cognitions and structural properties of eCollaboration has been out of scope for IT-professionals, resulting in a situation where eCollaboration doesn't reach its' full potential.

This is one important lesson learned from this study, and it re-enforces and validates the theoretical arguments brought forward in the theoretical framework; eCollaboration is not only about technology.

5.1.1. Tools

When taking a global approach towards eCollaboration in AstraZeneca the most striking finding is the lack of consistency and coordination in terms of which tools are being rolled out and how this is done throughout the global organisation. As presented above, a number of similar tools with overlapping capabilities are present and forces users to navigate between different systems in different contexts. This relates to all eCollaboration capabilities in place today, collaborative workspaces, web conferencing and people search. Only e-mail and electronic calendars are one consolidated consistent globally delivered service. The effects of these overlaps are a higher cognitive load brought on to users. Another striking property of the current toolkit are the, according to end-users, inadequate integration between different collaboration tools and more frequently used tools such as workplace applications like word processors, e-mail clients, calendars and operating system.

Further some of the tools in place like NetMeeting are regarded as obsolete, cumbersome and inefficient to use, which forces users to spend time on unproductive workarounds and administration instead of efficient collaboration. This may also be important for collaboration with external partners; you don't want to lose face not mastering the tools when collaborating with external partners.

Without having any clear figures of aggregated sums, it's not unreasonable to suspect that another effect of this fragmented environment may be a higher total cost for delivering the collaborative capabilities, if one includes cost of pre-studies, evaluation, not getting full scale discounts on licenses/paying full-scale licenses but not using it, training material, maintenance etc. When trying to understand the roots to this bitty situation, fragmented resource allocation and high decisions autonomy in different parts of the company could partially explain the situation. Another reason might be based in the statement that AstraZeneca traditionally seen has been a wealthy organisation that has had the possibility to afford a slightly exaggerated redundancy. Streamlining and decommissioning of local systems would probably save money, lead to increased usability and improve collaboration between employees on local, regional and global level.

5.1.2. Cognitions

Looking to the cognitive elements it's evident from the interview results that information and training has not been in focus in relation to collaboration tools. There is not any consistent way of approaching training and information. Not prioritising information and training around IT-tools and capabilities might not be unique for collaboration tools but has more significant impacts since efficient use is related to the lowest level of knowledge held by a larger group of people. If five people are to use a collaborative tool and one doesn't know how to use it, it will hamper the performance of all team members. Another important finding that validates the theoretical perspectives on cognitions is that some respondents has emphasised the need for more training on how to work using the tools more than how the tools specifically work.

There is also a cost perspective that I find important to emphasise, since many of our respondents claim that training and information is being carried out by their colleagues, this might be a sub-optimal solution. No account will be charged with cost for information and training carried out in this fashion but time and therefore money is being spent in many places in the organisation. Having people writing their own redundant instruction booklets for tools etc. may most probably result in higher cost and most probably also in lower quality in the end result since proper attention and input has not been gathered.

In an organization like AstraZeneca there might though be a need for local adaption of the training material to fit language differences, different local cognitive models, or even different needs in different business areas.

5.1.3. Structural components

The structural components are hard to grasp and make tangible. But the interviews validates that structural components are important both seen to usage of tools (management support and time allocation for training) but also in relation to non-tool related aspects such as incentives for cross-collaboration and collaborative culture. An

important part of eCollaboration success is the focus, financial and non-financial support and attention that eCollaboration initiatives achieve from managers.

Further I see structural components as crucial for maintaining legal and regulatory compliance in terms of what information is handed using different tools but also when it comes to archiving and records retention. This is especially important for companies working in the pharmaceutical industry where the risk of intellectual property disputes are always present and risks related to handling of personal records are also present.

One lessons learned from the AstraZeneca case is that IT organisations might not consider cognitions and structural issues around collaboration as their responsibility since they traditionally has been tasked mainly with technology and tools. Therefore I find this an important contribution to the field of eCollaboration. When a large organisation, like AstraZeneca, should implement an eCollaboration strategy it's important that the relevant groups, not necessarily directly linked to the IT-department, are included.

5.2. Moving beyond strong tie eCollaboration

Having outlined and discussed factors that are important for eCollaboration I will continue discussing how eCollaboration via strong, weak and potential ties can be enhanced with improvements in the current toolkit and introduction of new tools.

5.2.1. Support for collaboration via strong ties are in place

Taking a standpoint in the theoretical discussion about ties one can argue that the current standard toolkit (e-mail, collaborative workspace, web conferences and a very rudimentary people search function) mainly support work in more tightly linked groups with stronger links. Getting access to information stored in collaborative workspaces of groups that you aren't a member of is hard and seeing this as a way of being able to exploit potential ties is not valid, since the process of nailing down what the content of eRooms are and identifying the individual content owner, by using people search functions, seems to be cumbersome according to users. E-mail doesn't provide any specific means for maintaining or developing weak ties more than supporting the actual exchange of messages. I therefore argue that high-level capabilities for supporting strong ties are in place today in AstraZeneca, even if there are still great possibilities to improve the usability and the end-user satisfaction.

5.2.2. Improving collaboration via weak and potential ties

As argued in my theoretical framework, also weak and potential ties are important for collaboration and knowledge exchange and should be supported by an eCollaboration platform. I have researched use of two eCollaboration tools not available enterprise wide in AstraZeneca today and will below discuss them in relation to ties. I have also investigated attitudes and perceptions around current tools for finding people within AstraZeneca. I argue that such tools can be extended to support also collaboration seen from potential ties.

5.2.2.1. Wiki

Where to place wiki technology in a tie model is not apparently evident though. A wiki is a tabula rasa that can be filled and structured in many ways. It can function both in

smaller teams with stronger links when jointly building up a body of knowledge but it can also function and bring value to groups that are more loosely attached such as a department or larger entities consisting of several smaller groups.

I recommend further evaluation of wikis on a larger scale using a more centralised mode of delivering this service. As showed in the wiki section above, there are already a growing number of wikis in place with no common technology platform and no common cognitive or structural platform. To avoid the cumbersome and expensive processes of trying to bring order, migrating content and broker wills an harmonization process could be clearly beneficial. Wikis provide a better overview of content than the current collaborative workspace facilities that are mainly being used for sharing documents. Wikis may also provide overview on other projects that you aren't engaged in yourself but you might have a weak working tie to people in such projects e.g. people from the same department working in different projects. Since sharing of information between projects has been indicated as a problem area showing low satisfaction among AstraZeneca employees, I recommend focusing on using wikis as a tool for collaboration between projects and for overview and preventing duplication of efforts. That would be similar as bridging groups consisting of persons with stronger ties.

A discussion around introducing wiki technology would never be complete without a discussion of the risks associated with introducing a new tool. The most apparent risk I see is that wikis may encounter the same types of problems as collaborative workspaces are doing today. If policies on information access (both reading and editing) and how to structure information in wikis hasn't been sorted out wikis may end up as just another repository of unstructured information that is hard to digest and understand. If access rights aren't sorted out properly wikis may also pose threats to intellectual property by granting access to people that shouldn't have access to certain information. The number of wiki libraries may also prove confusing, and increase cognitive load on a user level. Further I see also a risk with wikis, when it comes to how a wiki could stimulate a different way of working. In a wiki users may insert and jointly develop material instead of uploading finalised documents, which is the current modus operandi in eRoom for example. Changing the way documents and information is being created and put together will require AstraZeneca to focus on cognitive and structural aspects to fully exploit the new tool. As proposed earlier in the thesis it's also important that tools are integrated and intuitive to use, and that it's easy to keep track of updates etc.

5.2.2.2. Instant messaging

Looking further at how weak ties can be maintained and developed, I see instant messaging as one way of keeping track and maintain visibility of contacts that you have been associated with in previous projects, or other settings, but you don't interact with on a daily basis at this stage. The presence awareness and possibility to manage contact lists can be very useful for this purpose. There is a possibility to arrange instant messaging lists based on different characteristics expressed by users, making it possible to create lists for current projects and previous projects. There is also a possibility to add more information to an instant messaging function, like the possibility to write short status messages on ones current project, or where one is located, or other messages like requests for assistance for example. That could bring extra value and provide an increased possibility of maintaining, updating and exploiting weak ties. From my own research in AstraZeneca I also conclude that instant messaging also can increase awareness and feeling of belonging and reduce isolation in global teams. It's also

reasonable to expect that instant messaging can have an effect on collaboration and communication in tighter groups, speeding up interaction through awareness of presence for example.

Instant messaging may also provide lower barriers for communication due to its more informal nature compared to email but still being less intrusive than a telephone call. For persons not having English as native tongue, communicating via instant messaging might be more comfortable than having a regular phone call, but still faster and more efficient than waiting for e-mails. I find it reasonable to position instant messaging somewhere on a sliding scale ranging from email to telephone.

Looking to the risks of introducing instant messaging in a corporate setting, disruption and distraction of work processes may be a risk and the risk of becoming unproductive due to spending too much time socialising and sending messages that doesn't really contribute to specific tasks must be considered when implementing instant messaging. As mentioned earlier in this thesis, legal compliance and being able to produce records of communication both in intellectual property cases but also in case related to health risks etc are important for companies in the pharmaceutical industry.

Risks related to disruption and distraction may be mitigated by educating users on how to use instant messaging and in what situations it's suitable to use. I believe that a basic understanding of different ways of manipulating availability status will be very important. If one finds it important not to be disturbed while executing a certain task, there should be clear methods for indicating that. Looking at the risk of spending too much time socialising at instant messaging, I argue that this risk relates both to trust in employees and trust in the processes for setting and following up on goals. Further I firmly believe that there can also be a value of socialising and interacting via instant messaging since building and maintaining relationships is important for collaboration and knowledge sharing.

Proper archiving and retention policies for instant messaging must be put in place for legal compliance to mitigate legal risks.

5.2.2.3. People search

Potential ties are probably in abundance in a large corporation like AstraZeneca but exploiting them is hard due to geographical, language, cultural and organisational boundaries. In respect to locating other employees with similar interests and backgrounds, the personnel search functions currently implemented in AstraZeneca provide a service analogous to a telephone directory. Using these services you can find a person using the exact spelling of their name, which requires quite a high level of prior knowledge in order to be useful. I therefore believe that the People Search functions in place should be extended and improved to support exploiting potential ties but also for making new teams productive faster by speeding up and facilitating social interaction. As respondents have indicated it can also be useful to get a notion of where people belong in the organisation to be able to judge the relationship etc. If employee turnover rates are increasing as some respondents have indicated and people doesn't stay in the company for more than shorter periods, there will be an increasing need for accelerating and speeding up relationships building.

Handling and storing of personal information can impose both legal and operational risks to AstraZeneca if management of the information isn't thoroughly considered. Such a system may also disrupt current ways of approaching people, providing possibilities to leapfrog the chain of command for example. There may also be a need for a mechanism that protects specific experts from too many request and contacts. How people understand the purpose of the system and if they adopt it will also affect the critical mass of the system, something that will be utterly important.

5.3. Future collaboration landscape and discussion on model validity

In figure 7, I outline a future landscape of tools for increasing support for collaboration in globally distributed teams.

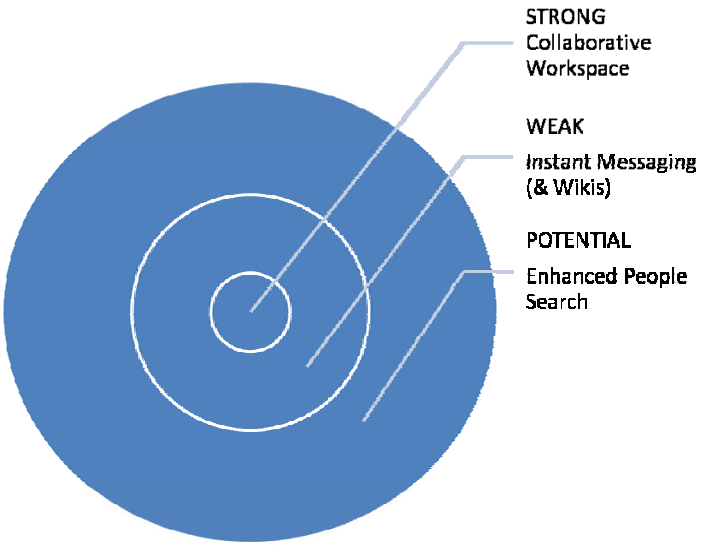

Figure 7. Proposed tool landscape to exploit strong, weak and potential ties (own production).

Since the strength of a tie and what a tie is are not fully defined it's not easy to distinguish *one* particular type of setting where *one* specific tool is only useful. The different tools should more be looked at as having a larger density in one ring and less density but still being useful in other rings. Figure 7 is also over-simplified when it comes to relative size of the different rings.

When discussing different tools to be used in relation to strong, weak and potential ties in an AstraZeneca context, it is important to emphasise and understand that the research and sales and marketing doesn't happen along one linear and formal path but through many different ways of working and interaction. One characteristic is that researchers and developers often build on knowledge of others, add facts together and use increments and input from many sources in a combination of collaborative and individual work. When supporting development and research processes, flexibility and agility is important for supporting this unstructured way of working.

There are however no guarantees that implementing the tools suggested above will reach expected effects. The recommendations in this thesis work are based on a

combination of analytical generalisations and case study empirical validation and can only be held likely to affect ties. Measuring effects and ends of implementing of new tools would be crucial for determining implications as well as larger scale pilots. With more time, resources and mandate this could bring value both to the academic field of strong-weak-potential ties and also to large organisations eager to understand better how collaboration takes place. One example that stands very clear though is that, unless proper focus is given also to cognitive and structural aspects of collaboration the expected effects of implementing tools will most probably not be fully met.

Approaching collaboration from a ties perspective is of course an over-simplification of how employees interact and work together. A drawback of the model is that the division between strong, weak and potential ties gives little help to answering the questions about how actual relationships are being initiated or why certain people tend to engage in relationships that later on can be divided into strong or weak ties. The model focuses only on individual relationships at a micro level but leaves little guidance on how and why employees tend to search for and form new ties. What are the basic motives for collaboration, where do employees look for new relationships and how do relationships evolve? I believe that the locale in which you look for and find new contacts has previously been strongly restricted to your physical quarters.

How a large and distributed organisation like AstraZeneca is to approach the formation part of relationships is also important as well as knowing how to maintain ties that has already been formed. One important part of forming relationships still relates to personal meetings, there is no tool as rich as a personal meeting. Therefore AstraZeneca and other dispersed organisations must acknowledge the value of face-to-face meetings for initiating new ties, those ties can later on be developed and maintained via eCollaboration tools. When distributing and allocating travel budgets a slight preference may be given to travels aimed at forming relationships in a new setting, before meetings that could be conducted via electronic means.

For understanding and improving eCollaboration in AstraZeneca when it comes to what tools to have in place and how to facilitate use of these I though find the strong-weak-potential ties model as fertile.

6. Conclusions and five key strategic messages for eCollaboration in AstraZeneca

In this chapter I conclude my research and follow up on my research aspiration. In addition to that I also present five recommendations to be considered in relation to the AstraZeneca eCollaboration strategy.

The aspiration of this study is to investigate how collaboration and communication between people working in a dispersed organisation can be supported through use of computer software. My review of previous research, both theoretical and empirical, along with my own case study at AstraZeneca lead up to a set of recommendations on how eCollaboration can be better supported in AstraZeneca. The recommendations are geared towards AstraZeneca and the current state but are probably also valid in other large distributed organisations with a similar current state as described above.

The recommendations are related to software tools supporting collaboration but also relates to cognitions and structural aspects that are to support usage of eCollaboration tools and processes. Recommendations 1-4 are clear actions to improve eCollaboration substantially while recommendation 5 should be seen as a set of guiding principles to consider when managing eCollaboration.

1. Improve the capabilities already in place to support collaboration via strong and potential ties:

- Collaborative workspace for collaboration in groups with stronger ties. Clear improvements needed when it comes to integration with other more heavily used tools, information access policies, how to structure content, and how to approach information life-cycle issues. If a replacement of the current collaborative workspace technology is being considered, it would be wise to focus on the main issues brought forward by our respondents related to structural issues more than merely technical aspects.
- People search functions in AstraZeneca today can be improved and enhanced to accelerate and facilitate potential ties exploitation. Consider the potential effects on work and pay proper attention to development of positive usage norms. If not considered wisely, people search may be disruptive in relation to existing social norms.

2. Introduce the following new capabilities to support weak ties:

- Instant messaging for improved collaboration and maintenance of weak tie contacts. Instant messaging can also work to counteract the feelings of isolation and remoteness in distributed settings.
- Central wiki platform for information sharing between individuals in different teams having weak links. Wikis may also improve collaboration between people who share a strong tie, when information about a topic can be developed jointly.

3. Start to measure end-user satisfaction with eCollaboration. This thesis can act as a baseline, but performing a formal assessment of customer satisfaction on the collaboration capabilities in place in AstraZeneca today would be important for

increasing the knowledge about eCollaboration. Having high-quality data will also facilitate decision making and action taking. Design the formal assessment in such a way that it acknowledges that collaboration is not only about technology but also about cognitions and structural aspects. Make this a returning happening and make sure to follow up on results properly.

4. Assign responsibility for eCollaboration to a specific entity within the company.
To put the recommendations above into action, assign clear responsibilities for eCollaboration and acknowledge that eCollaboration must take into account not only tools but also cognitions and structural aspects. Make this function visible throughout the organisation and allocate as an important role to coordinate different initiatives stemming from various parts of the business. Raise the issues of mandate and budgets for eCollaboration to inhibit further fragmentation of the collaborative environment. Since cognitive and structural issues aren't clearly classical domains of an IT-organisation this function needs to include members from several areas of the AstraZeneca business.

5. Work for lower barriers for collaboration, seen both from tools, cognitions and structural aspects by

- Integrating collaboration tools with each other and with more heavy used tools to a larger extent to usability to reduce the hassle and negative sensations around using collaborative tools. If introducing new tools, give priority to tools that provide integration out-of-the-box[4].
- Reducing cognitive load by considering reducing the current number of multiple platforms delivering similar capabilities.
- Earmarking funds for information and training related to changing work styles when deciding to roll out new tools. Do not only focus training and information efforts on buttons and clicks!
- Assessing and making incentive systems and management support for collaboration more visible than today.
- Acknowledging that the success of AstraZeneca is not only about the internal collaboration capabilities but also how these can interplay with external parties. Lower barriers for external collaboration is important but it might be the case external parties have strong preferences on which tools to use. Pay attention to how tools can interplay and federate instead of forcing external parties to acknowledge the AstraZeneca hegemony.

Having many knowledge workers active in a globally distributed setting with employees stemming from various cultural backgrounds are rather new to AstraZeneca and many other organisations as well. Investigating in increasing knowledge on eCollaboration and enablers for successful eCollaboration will pay off and be a competitive advantage since globalisation and related travel cost, CO2 emission awareness and work life balance are important for shareholders, stakeholder, and for attracting talented employees. If managed properly eCollaboration can make a substantial contribution to AstraZeneca success!

[4] Out of the box are items, functionalities, or features that don't require any additional installations, configurations or products.

7. Speculating and directing further studies

In this chapter I will present a number of interesting tracks and trails that would have been interesting to follow during the course of the study that I haven't been able to pursue due to time constraints and my scope. I find it important to forward these to the wider research community as well as to AstraZeneca employees interested in collaboration. The themes presented below show both academic and practical value.

One study with large academic and practical value would be to study the effects on weak and potential ties after proper implementation of new eCollaboration tools like wiki, instant messaging and people search capabilities. Do they stimulate new connections between individuals and what are the effects and ends of such connections? Do they make it possible to maintain and exploit connections from previous projects and engagements, the weak links a person may hold, inside and outside the company? What would be the effects and ends of paying attention to weak links? From an academic perspective, cost might not be a crucial issue but balancing cost and ends will be highly important for large scale implementations in global companies.

The current situation with an increasing number of AstraZeneca employees' eCollaborating is new and rather immature as can be seen from the interview findings presented above. Further studies could include a more statistical validated investigation based on the constructs that has been outlined in this study, tools, cognitions and structural aspects. Investigating diffusion rates, adoption rates and customer satisfaction in different parts of the organisation may bring further knowledge on the connection between different initiatives and events carried out and the effects visible in the organisation. How and where should we as an organisation spend our money wisely if we would like to reach a certain effect in a certain time?
Comparisons with other large organisations in the pharmaceutical industry and other industries would from an academic perspective be very interesting. What impact does the organisational history and culture have on the company's eCollaboration environment?

AstraZeneca has many characteristics that make it rather special as an organisation.

- AstraZeneca is the result of a merger between two companies with diverse company cultures and computer systems in place.
- AstraZeneca has traditionally been a rather wealthy organisation with a low focus on cost.
- AstraZeneca has a large proportion of PhDs in comparison to other large organisations. Employing stars with a high level of education and trust in their own capabilities and probably a high expertise in their own field may inhibit adoption of standardised eCollaboration solutions.
- AstraZeneca works in a highly regulated environment
- AstraZeneca has 67 000 employees, connected in more or less one value chain, making it a very large but somewhat diverse internally.

All these aspects could have effects on the collaboration environment, and how resources are being distributed between tools, cognitions and structural investments.

A more systematic approach towards respondents in AstraZeneca based in different countries or stemming from different cultural origin would also be very interesting to carry out to distinguish and further elaborate on differences based on other personal features, like local cultures for example. People based in different countries have probably different attitudes towards appropriate interaction and collaboration and also different attitudes towards on how tools can be used. People from some cultures may have a preference towards flatter organisations with a more open information flow whereas others may privilege a more hierarchical structure with larger restrictions on information sharing and decision autonomy.

8. References

Best S.J., Krueger B.S., (2006). *Online interactions and social capital: Distinguishing between New and Existing Ties.* Social Science Computer Review. Vol. 24, no. 4. p. 395-410

Bullen C. V., Bennett J. L., (1990). *Learning from user experience with groupware.* Proceedings of the 1990 ACM conference on Computer-supported cooperative work, p. 291-302

Castner et al. (2007). *The Global Pharmaceutical Industry.* Accessed 2008-03-05 from http://www.duke.edu/web/soc142/team2/shifts.html

Coleman J. S., (1988). *Social capital in the creation of Human Capital.* The American Journal of Sociology. Vol. 94. p. 95-120.

Davis F.D., (1989). *Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology.* MIS Quarterly. Vol. 13, no 3. p. 319-340

Davis G.B., (2002). *Anytime/Anyplace Computing and the Future of Knowledge Work*, Communications of the ACM. Vol 45, no. 12. p. 67-73

Dingsoyr et al., (2005), *Practical knowledge management tool use in a software consulting company.* Communications of the ACM. Vol. 48, no. 12. p. 96-100

Drucker P.F., (1999). *Knowledge-Worker Productivity: The biggest challenge*. California Management Review. Vol 41, no. 2. p. 79-94

Dwyer C., (2007), *Digital Relationships in the 'MySpace' Generation: Results From a Qualitative Study.* Proceedings of the 40th Hawaii International Conference on System Sciences

Gartner (2007). *Segment Collaboration Into its Four Main Constituents for Maximum Return.* Accessed 2008-03-05 from http://www.gartner.com

Granovetter M.S., (1973), *The strength of weak ties.* The American Journal of Sociology. Vol. 78, no. 6. p. 1360-1380

Grudin J., (1994), *Groupware and social dynamics: eight challenges for developers*. Communications of the ACM. Vol. 37, no.1. p. 92-105

Hansen M.T., (1999), *The search transfer problem: The Role of Weak ties in Sharing Knowledge across Organization Subunits.* Administrative Science Quarterly. Vol. 44. p. 82-111

Hansen M.T., Mors M. L., Lovas B., (2005), *Knowledge Sharing in Organizations: Multiple Networks, Multiple Phases.* Academy of Management Journal, Vol. 48, no. 5, p. 776-793

Huysman M., Wulf, V. (2004). *Social Capital and Information Technology.* The MIT Press. Cambridge.

Levin D.Z., Cross R., (2004), *The Strength of Weak Ties You can Trust: The Mediating Role of Trust in Effective Knowledge Transfer.* Management Science. Vol. 50, no. 11. p. 1477-1490

Lou H., Lou W., Strong D., (2000). *Perceived critical mass effect on groupware acceptance.* European Journal of Information Systems. Vol. 9, no. 2. p. 91-103

McAfee A., (2007). *How to Hit the Enterprise 2.0 Bullseye.* Accessed 2008-02-04 from http://blog.hbs.edu/faculty/amcafee/index.php/faculty_amcafee_v3/how_to_hit_the_enterprise_20_bullseye/

New York Times, (2007). *Social Networking Site.* Accessed 2008-02-04 from http://www.nytimes.com/2007/09/09/realestate/keymagazine/909CONDOS-txt.html?pagewanted=3

Orlikowski W. J., (1992). *Learning from notes: organizational issues in groupware implementation.* Proceedings of the 1992 ACM conference on Computer-supported cooperative work. p. 362-369

Orlikowski W. J., Gash D. C., (1994). *Technological frames: making sense of information technology in organizations.* ACM Transactions on Information Systems (TOIS). Vol. 12, no. 2. p. 174-207.

Sundgren M., (2007). *Information Management Survey 2007 in AZ R&D.* AstraZeneca internal report.

Wikipedia, (2008). Instant messaging & messengers. Accessed 2008-03-08 from http://en.wikipedia.org/wiki/Instant_messaging

9. Appendix: User attitudes towards currently deployed and piloted eCollaboration tools

Current tools	Value brought to users	Current state
Collaborative workspaces	Work with documents in a controlled fashion, keeping track of changes and versions and getting information on updates not having to check manually	Multi-component platform, restricted integration with other tools, no clear policies and procedures in place for how to structure and access information
Web conferencing tools	Gives visual support to scheduled teleconferences. Provides possibilities for improvised sharing of desktop and other applications.	Multi component platform, not well integrated with other tools, no training on how to conduct and efficient distributed meeting, inconvenient and non-intuitive usage.
People search tools	Helps people find others holding information important for performing ones tasks.	Multi component platform, not well integrated with other tools, users request richer information and more advanced ways of searching people, not globally consistent in terms of language and level of information inserted, many workarounds
Piloted tools		
Wiki tools	Helps employees share information with a larger group in an easy way. Helps building knowledge in a collaborative manner.	Growing number of independent implementations; no central service or governance process; Security and intellectual property risks if not considered before implementation.
Instant messaging tools	Provides a way of getting quicker answers to questions and also a way of providing awareness both in relation to presence but may also convey awareness about activities etc. Can also provide a possibility to maintain contacts from earlier projects by saving people in contact lists.	Small number of independent clients in place. No integration with other heavily used tools such as e-mail, workspaces or information sources like people search functions. No central archiving and retentions policies in place and no critical mass of users.