CHALMERS

Building Trust in Virtual Teams-Evaluating Online Collaboration from a Human-Centred Design Perspective

Master of Science Thesis in the Masters Degree Programme, Interaction Design & Technologies

SEFAT CHOWDHURY

AZAD SALEH

Department of Applied Information Technology

Division of Interaction Design

CHALMERS UNIVERSITY OF TECHNOLOGY

Gothenburg, Sweden, 2013

Report No. 2013:120

SEFAT CHOWDHURY
AZAD SALEH

Technical report no 2013:120

Examiner: Staffan Björk

Chalmers University of Technology
Department of Applied Information Technology, Division of Interaction Design
SE-412 96 Göteborg, SWEDEN
Telephone [+ 46 (0)31-772 1000]

Abstract

This thesis investigates how enabling the social nature of online communication can lead to building trust in virtual team collaboration. This was mostly done by researching previous study results and connecting them to establish a theoretical linkage between rich online communications and high trust. Furthermore, an empirical study was conducted at Volvo Information Technology located at Gothenburg, Sweden in support to the key insights developed. In the working process, firstly, the challenges in virtual work were identified in traditional online collaboration (i.e. via Email, Instant messenger, Video conference etc.), which was followed by a survey to get an idea on the usage of collaboration tools at Volvo IT.

The study further extends to understanding the changes in communication behavior of people outside workplace over the last decade and hence the changes that have occurred in users' mental model and user experience of online communication. Connectivity has become another basic need in modern lifestyle and the online world is catching up with the offline world faster than we ever thought possible. The rich social applications facilitate innovative ways to create and maintain relationships online by allowing people to actively create content and interact with others. This is even more noticeable in relationships where people are geographically dispersed and possess a global mindset.

As technology advances, global companies want to benefit more from the online collaboration. With current collaboration tools available, companies like Volvo IT is running online live meetings, training workshops, webinars and so on. However, the non-technical variables of a successful team such as group cohesion and trust etc. have remained as big concerns when it comes to online collaboration.

This study argues that traditional online collaboration tools do not encourage online social engagement to support cognitive and psychological needs of the virtual team members who use them on regular basis to coordinate with each other. Social communication is fundamental in creating good relationships and foster group dynamics similar to that of traditional face-to-face work environments.

The study also analyses the user experience of Facebook to understand why this and other social networking websites are so successful in creating relationships online that the collaboration

strategists are eyeing onto despite the so-called productivity issues. Finally, the thesis also looks into few latest industry trends and movements in the field of enterprise online collaboration by the time of writing it.

Acknowledgement

This thesis was made in cooperation with Volvo Information Technology and the Division of Interaction Design at Chalmers University of Technology. We are very thankful to Volvo IT and Chalmers that offered us this opportunity, especially to Thommy Eriksson and Magdalena Molin, who set up the idea of this study.

Yael Katzenellenbogen and Magdalena Molin from Volvo IT, we are truly fortunate to have met special people like you, thank you for your valuable guidance and supervision.

Thommy Eriksson in a few words: You have been a tremendous mentor.

We would like to express our gratitude to Dr. Fang Chen (Human-Centered Design) and Dr. Sus Lundgren (Aesthetics of Interaction) for their invaluable knowledge sharing during the coursework at Chalmers which has contributed to this thesis work in many ways.

Magnus Jansson, Lennart Wärmlind, Emelie Sundborn, Daniella Gundén and others at Volvo IT, thank you for all your help, this thesis was not possible to complete without you.

Last but not least we would like to thank our families for their support and sacrifices in times of challenge.

August 2013

Sefat Chowdhury
Azad Saleh

Gothenburg, Sweden

Table of Contents

Abbreviations

GDT	Geographically Dispersed Teams
CMC	Computer Mediated Communication
GUI	Graphical User Interface
UI	User Interface
P2P	Peer-to-Peer
UGC	User Generated Content
HCD	Human-Centred Design
Ajax	Asynchronous JavaScript and XML
UX	User Experience
VP	Virtual Proximity

Key Concepts

Virtual teams: Geographically dispersed teams that communicate with each other by using computer driven technologies.

CMC: The possible modes of communicating online between two or more individuals e.g. email, instant messaging, forum, blog etc.

Synchronous: Refers to real time communication, e.g. audio, videoconference and live chat.

Asynchronous: Refers to non real time communication, where collaborators do not communicate concurrently such as email, forum and blog.

Trust: An important building block for effective performance in organizations. It lets us focus on completion of a project rather than spending time on personality conflicts and politics.

Discussion Forum: A tree-like or hierarchal discussion site on the web where people converse with each other by posting messages.

Virtual Proximity: One virtual team member's perception of distance while working with another virtual team member.

Human-Centered design: "A methodology that puts users at the center of the design process" (Norman, 1998; Buchanan, 2001).

Social Media: Social spaces on the web where people share, create, exchange information and ideas (e.g. texts & multimedia) by using different means of interactions. Web tools like wikis, blogs, forums etc. are examples of social media sites.

User Experience: The feelings (i.e. emotion) that the user gets when using a product (Christian Craft, 2012). ISO standards define it as "a person's perceptions and responses that result from the use or anticipated use of a product, system or service" (International Organization for Standardization, 2010).

Co-experience: Creating meaning and emotions together through product use.

Social Mechanisms: Consists of three mechanisms for communication (*Conversation*, *Awareness* and *Coordination),* which helps to build team trust and commitment (Egea, 2006).

Usability: Measures how easy, pleasurable and comprehensible a product, system or service is to use and interact with.

Excise: The number of extra steps or clicks to accomplish a task (Cooper et al, About Face 3: The Essentials of Interaction Design, 2007).

Instrumental qualities ("Pragmatic"): A dimension of product qualities, which refer to performance and pure usability aspects (Minge, 2008 p.1).

Non-instrumental qualities ("Hedonic"): A dimension of product qualities, which refer to beauty, visual aesthetics, identification and stimulation (Minge, 2008 p.1).

Web 1.0: The traditional web, where users simply act as consumers of content, meaning that the users could view the webpages but not contribute to the content.

Web 2.0: An ideology and collective name for modern web tools (e.g. social networking sites, wikis, blogs, video sharing, web applications etc.). It is the successor of traditional web and is more dynamic and interactive than Web 1.0. In addition to this, it includes user participation and social networking.

Tags: A keyword that can be attached to digital objects on the web, e.g. a video, an image or a text entry etc., which helps to describe and find content when searching or browsing the web.

Folksonomy: "The practice and method of collaboratively creating and managing tags to annotate and categorize content" (S Beldjoudi , 2011, p.1).

Ajax: This combines HTML, CSS, JavaScript and XML and makes up for a faster, more interactive and user-friendly web.

Microsoft Lync: An Instant messaging client which is used with Microsoft Lync server.

SharePoint: A collaboration web platform with a set of web technologies supported by one common infrastructure. It has an interface similar to Microsoft office by default and is used for multiple purposes such as storing, sharing and managing files etc.

Microsoft Outlook: An email application that additionally includes calendar, contact manager, a journal etc., that can work with Microsoft SharePoint server for multiple users in an organization.

Social communication: A way to improve interpersonal relationships and group cohesion that can lead to high trust. It is fundamental to create good relationships and foster group dynamics similar to that of traditional face-to-face work environments.

Chapter 1: Introduction

1.0 Introduction

The concept of virtual teams and online collaboration has been around for a while. Today many global companies around the world invest on state-of the art technological solution to get more out of virtual collaboration. It started with the most basic communication and information exchange through email and instant messenger, which turned out to be quite effective. Hence, working virtually started to become more pervasive as it helped cutting down significant amount of travel cost and the need of meeting face-to-face in many business occasions.

Over the next few years, we got higher bandwidth capabilities and the telecommunications vendors came up with more capable devices which facilitated more powerful virtual collaboration such as voice over internet protocol, video conferencing etc. Besides, connecting to enterprise network through Virtual private network, smarter enterprise software and the rise of smartphone and other mobile devices have allowed us more flexibility in terms of not having to be physically present at the workplace and still be able to work from home or anywhere else in the world.

However, once started for simple communication purposes, virtual collaboration showed the potential to do more and therefore progressive business thinkers thought about taking it to the next level by doing more complex tasks such as enterprise research, decision-making, workshop and team learning etc., with the involvement of members who are remotely located. As more complex things start taking place online, new problems were additionally realized. However, challenges remain when it comes to emulating the intangible human attributes such as-relationship, empathy, teamwork, trust, collegiality etc. in a virtual environment. Enough researches have been done to show that these ‘soft’ elements matter more when it comes to building successful virtual teams (Patrick Lencioni, 2002). Some companies might have the most advanced CMC infrastructure but without developing the intangible properties, it is not possible to build a truly successful virtual team.

Trust is probably the most important attribute that virtual teams strive to develop. This has been researched extensively and there are certain challenges associated with building trust in global virtual teams whose members are separated by different geographical

locations, cultures and time zones (Furst et al., 2004; Rosen, Furst & Blackburn, 2007; Lee-Kelley & Sankey, 2008; Kanawattanachai, P., & Yoo, Y. 2002).

As more people use technology both at workplace and outside workplace, it is important to learn whether the usages in these two different environments are well synced out or not. In big companies, updating to newer technologies take time as the true value of the changes to be made, require both operational and financial validation. So it is more likely that people enjoy better technological experience at their own expenses than they do at the workplace. However, this is not necessarily true in all cases.

Better technologies improve lives by making things easier and it also change certain human behaviors. Once we create some kind of technological dependency, we expect it to be the same everywhere. Otherwise, this bad user experience gives birth to frustration that affects many aspects of our daily activities, most importantly- decision making, being productive, maintaining relationships etc.

There has been a lot of research on finding connections between communication and building trust in virtual teams, but 'user experience' has not really been explored in this regard. For instance, Sarker, S et al. (2011) looks into the "theoretical linkages among trust, communication, and member performance in virtual teams". According to their study, communication and trust are inherently relational. Another study by Jarvenpaa and Leidner (1999), describes how certain communication behaviors influence building trust in global virtual teams. However, Henttonen & Blomqvist (2005) argues that "the focus on the communication and collaboration for virtual interaction has been built on technological usage, with limited attention to importance of social relationships in teamwork".
We argue that introducing human-centered design approach can help address the issues to build social relationships (Henttonen & Blomqvist 2005) amongst virtual team members and also focusing on user-experience can encourage certain communication behaviors (Jarvenpaa and Leidner 1999) to achieve desired outcome.

1.1 Motivation for Choosing this Topic

This project was initiated with the idea of building trust in dispersed virtual teams while interacting through collaboration tools. We figured that the interaction possibilities were limited with the present software available at Volvo Information Technology. As interaction designers, we found it quite intriguing to investigate this from a human-

centered design perspective and apply interaction design principles to find out possible meaningful solution that could support the initial idea.

1.2 Research Questions

Based on our motivation for choosing this topic, we framed two research questions as listed below:

1. How can human-centered design help address the problems in online collaboration such as-building trust in virtual teams?

2. Why should user experience of virtual collaboration be aligned to the online social communication experience of people outside work?

Chapter 2: Virtual Teams

2.0 Introduction

This chapter explains Virtual teams and relevant theories behind earlier researches made within the domain, such as what virtual teams are, the challenges of working in such teams, the factors that influence them (trust, social mechanisms and so on) and the characteristics of existing web tools etc.

2.1 Virtual teams

Virtual teams are geographically dispersed employees at different locations, developing a project through sharing and communicating their work (A. M. Townsend et al. 1998). Virtual teams are also known as 'geographically dispersed teams' (GDT) who work together across time, space and organizational boundaries.

Kristof et al. (1995) defines "global virtual team to be a temporary, culturally diverse, geographically dispersed, electronically communicating work group".
"The notion of temporary in the definition describes teams where members may have never worked together before and who may not expect to work together again as a group" (Lipnack and Stamps 1997, Jarvenpaa and Ives 1994).

The numbers of people in a virtual team depends on the size and scope of the assigned project and can range from a small group, say two people to a larger group of people consisting of more than a hundred (N. Ehsan et al. 2008). Furthermore, the duration of virtual teams may vary and can be short term, such as a few hours to long term that lasts over weeks, months and even years (N. Ehsan et al. 2008).

2.2 Why Virtual teams?

Virtual teams have several advantages over traditional teams and there are some good reasons as to why many enterprises choose them. First and foremost, companies can get much more done by processing 'more numbers of dynamic projects' using virtual teams as opposed to conventional teams that have to meet face-to-face to carry out their projects

(Linda et al. 2003). Furthermore, “Virtual teams provide many advantages over traditional teams, including the ability to bridge time and space, and better utilization of distributed human resources without physical relocation of employees” (Lipnack & Stamps, 2000).

Thus companies save time in this manner of working, reduces travel expenses and can rapidly get in touch or assign tasks with respective expertise amongst employees worldwide.

2.3 Computer mediated communication (CMC)

The communication between virtual teams occurs through computer mediated technologies which helps collaborators to communicate effectively online through internet (Wu Z.Q., 1996). Additionally, Paulsen (1995a) defines CMC as “Transmission and reception of messages using computers as input, storage, output, and routing devices.” Examples of CMC: s are e-mail, video conferencing, teleconferencing (audio), instant messaging (chat), blog and discussion forum etc.

CMC can be classified in the two categories:

1. Synchronous communication
2. Asynchronous communication

Synchronous communication happens real-time, meaning that the online interactions occur at the same time, like any ordinary conversation. CMC: s such as teleconferencing, video conferencing, instant messaging are synchronous.

Asynchronous communication on the other hand is where the interactions between collaborators do not take place concurrently. Examples of such CMC:s are mainly text-based, like email, discussion forum and blog.

2.4 Challenges of Working in Virtual Teams

Virtual work is different from traditional office work in many ways, as explained by RW3 Cultural Wizard (2012):

> “As human beings, we have been endowed with multiple senses and forms of expression that we rely on in our interpersonal communication. When

> deprived of some of those senses and forms of expression, we must compensate with others. For example, when asking for directions in a foreign country, we find a way to get an answer by using gestures and sign language that are seen and interpreted. In the virtual working world, we are deprived of the ability to employ all of our senses. Consequently, the information we receive from the senses that are being used must be amplified and translated. When we apply this situation to a team consisting of people from multiple cultures with different personal styles, the challenges grow even bigger."
> (Virtual teams survey report 2012, RW3 CultureWizard, p. 3)

Another challenge is to achieve high *Virtual Proximity* (VP), which is a term we introduce to define one virtual team member's perception of distance while working with another virtual team member. As the virtual teams connect and work only via the internet, team member's actual geographical locations do not affect *Virtual Proximity*. However, tools that are used for collaboration, their usage and overall company culture can influence *Virtual Proximity*. It is a research issue- what and how exactly high *Virtual Proximity* can be achieved. But poor virtual proximity is certainly not contributing to high trust, good teamwork, innovation or leadership in a virtual environment.

In 2012, RW3 CultureWizard– An intercultural training consultancy that specializes in creating online training tools and e-learning environment sent out survey invitations to clients, colleagues and other engaged in global business activities. 3,301 complete surveys were received from the participants of 102 countries who answered about the challenges of working in virtual teams (Kirkman B, L. et al. 2002; Jarvenpaa and Ives 1994). Given the contextual similarity and the diverse nature of participants' cultural background, we decided to use the survey results to draw insights for our thesis instead of trying to reinvent the wheel by designing a similar survey from scratch.

The following diagrams from RW3 Cultural Wizard (2012) below, shows the online meeting platforms used by the concerned participants (refer to figure 1). Additionally, figure 2 presents the communication technologies that are currently being used by the participants.

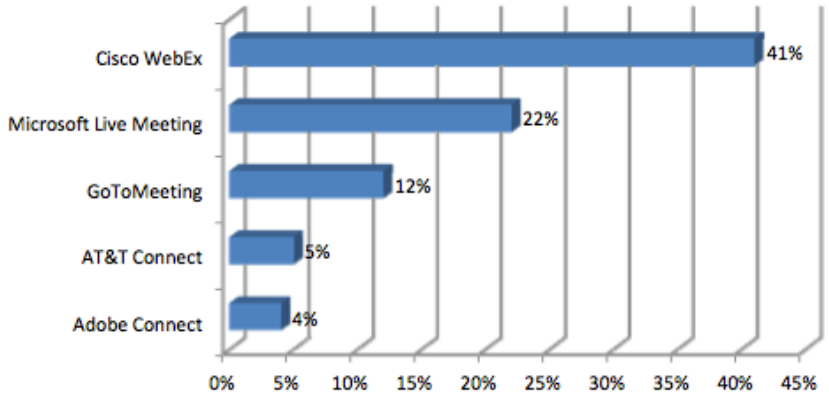


Fig 1: Online meeting platform used by the participants (source: 2012 virtul teams survey report,RW3 CultureWizard web: http://rw-3.com/)

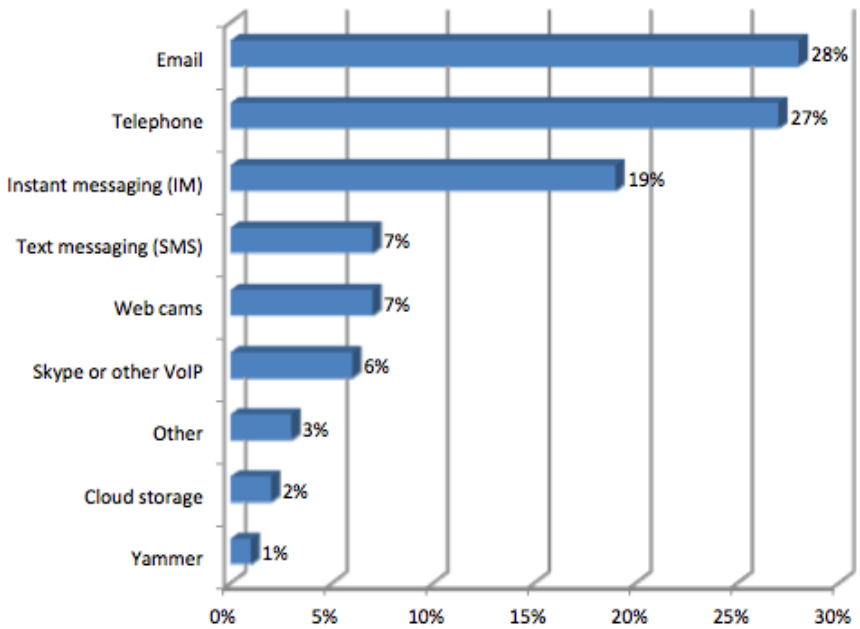


Fig 2: Communication technology used by the participants (source: 2012 virtul teams survey report, RW3 CultureWizard web: http://rw-3.com/)

These challenges were divided into two different categories– General Challenges (see figure 3) and Personal Challenges (see figure 4). General challenges are the challenges related to the impact of the surroundings or the environment, whereas the personal challenges come from subjective skills and ability.

2.4.1 General Challenges

Among all of the choices, time zones (78%) presented the greatest general challenge to virtual teams. This was followed by the three survey choices: The amount of time required to make a decision (74%), understanding different accents (69%), and cultural differences (59%). Language was in fifth position (51%), followed by holidays, local laws, customs

(47%), and technology (46%).

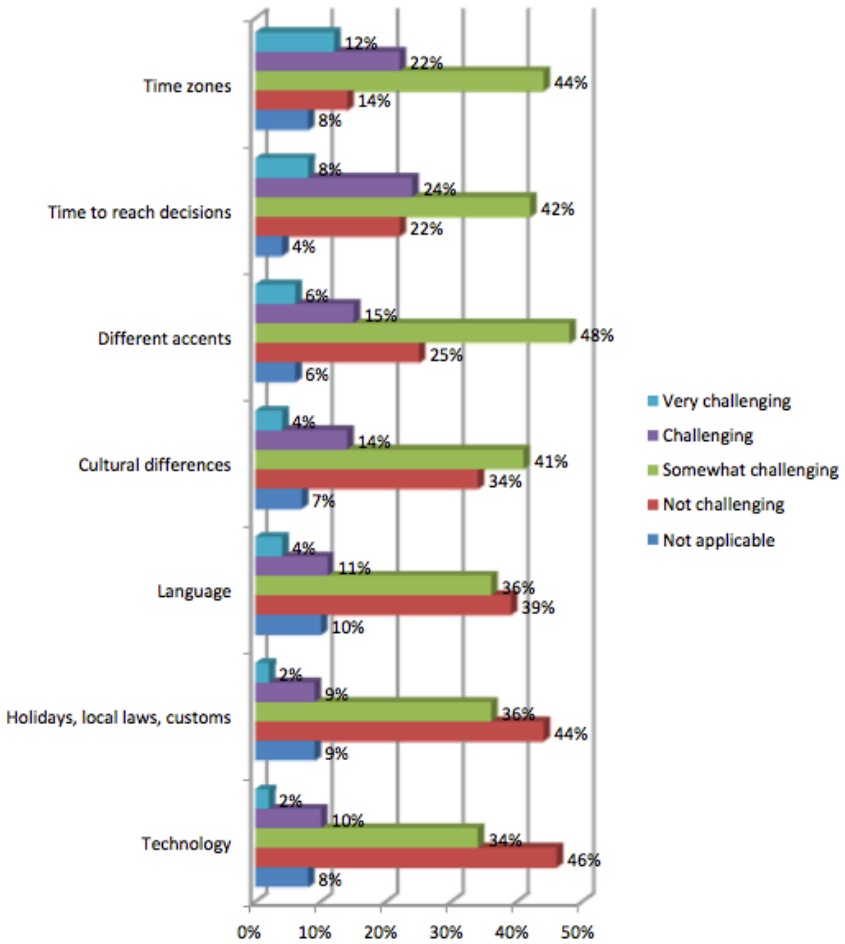


Fig 3: General challenge to virtual teams (source: 2012 virtul teams survey report, RW3 CultureWizard web: http://rw-3.com/)

2.4.2 Personal Challenges

Respondents indicated that the greatest challenge they faced was inability to read nonverbal cues (88%). This was followed by difficulty establishing rapport and building trust (75%), absence of collegiality (70%), difficulty seeing the whole picture (65%), reliance on email and telephone (57%), and a sense of isolation (47%).

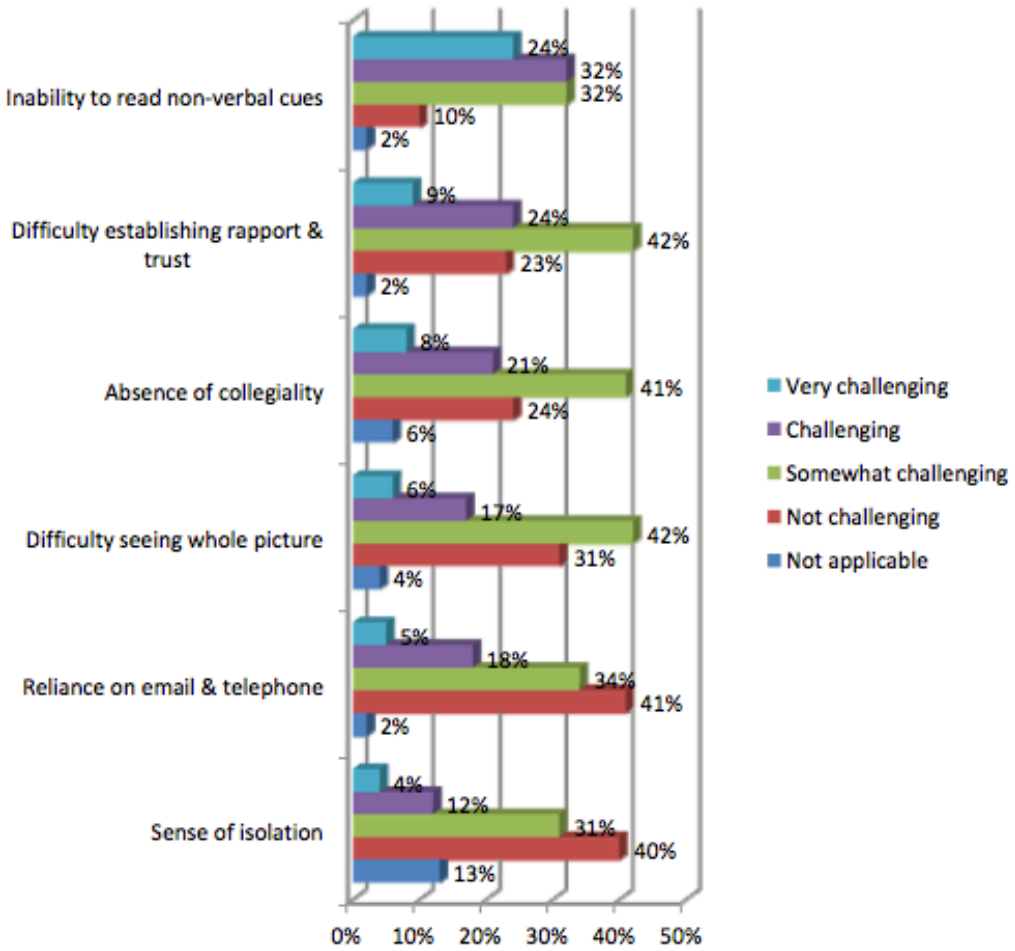


Fig4: Personal challenge to virtual teams (source: http://rw-3.com/)

2.4.3 Why is Trust so important?

Trust is an important building block for effective performance in organizations. It lets us focus on completion of a project rather than spending time on personality conflicts and politics.

Absence of Trust is considered as the base dysfunction of *the model* of *The Five Dysfunctions of a Team* (see figure 5) as Patrick Lencioni, (2002) mentions:

> "This stems from members' unwillingness to be vulnerable within the group. Team members who are not genuinely open with one another about their mistakes and weaknesses make it impossible to build a foundation for trust. This failure of trust is damaging because it sets the tone for the second dysfunction: *fear of conflict*. Teams that lack trust are incapable of engaging in un-filtered and passionate debate of ideas. A lack of healthy conflict is a problem because it ensures the third dysfunction of a team: *Lack of commitment*. Without having aired their opinions in the course of passionate

and open debate, team members rarely, if ever, buy in and commit to decisions, though they may feign agreement during meetings. Because of this lack of real commitment and buy-in, team members develop an *avoidance of accountability*, the fourth dysfunction. Without committing to a clear plan of action, even the most focused and driven people often hesitate to call their peers on actions and behaviors that seem counterproductive to the good of the team. Failure to hold one another accountable creates an environment where the fifth dysfunction can thrive. *Inattention to results* occurs when team members put their individual needs (such as ego, career development, or recognition) or even the needs of their divisions above the collective goals of the team."

(Patrick Lencioni, 2002, pp.188-189)

Fig 5: The model of The Five Dysfunctions of a Team

Another proposed trust model by Larry Prusack (2001), the director of IBM Institute of Knowledge Management (IKM), is presented below (see figure 6).

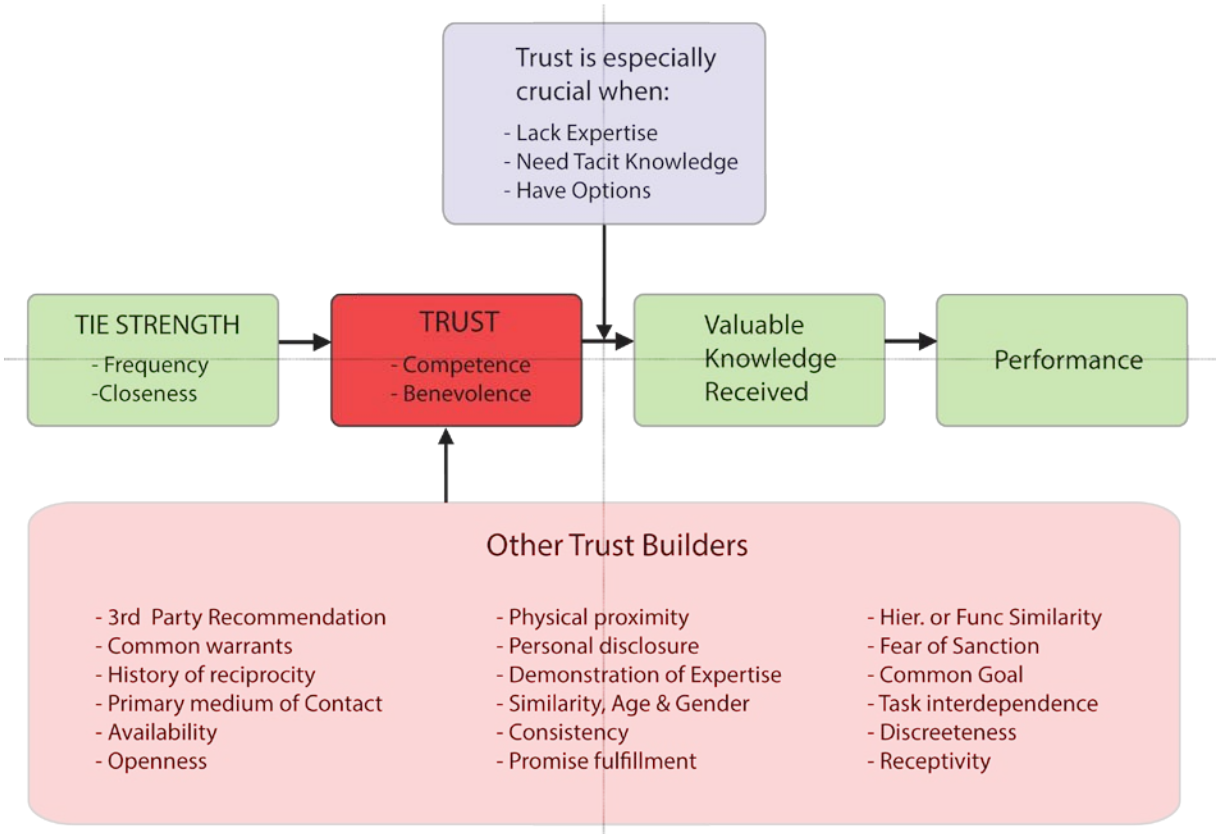


Fig 6: Larry Prusack s' (2001) proposed model of trust.

Larry Prusack's trust model (LPT) can be divided into three blocks- *input*, *trust* and *output*. Input consists of the strength (Frequency & Closeness) and other trust builders. The process block is made of competence and benevolence. The remaining parts can be considered as output. When we compare the input section of Larry Prusack's trust model onto the *Five Dysfunctions of a Team*, we can see several similarities between them (see figure 7). For example, the "nuances" of *the avoidance of accountability* and *fear of conflict* as discussed in the *Five Dysfunctions of a Team (FDT) are equivalent to* the closeness and frequency in Prusack's model respectively.

The personal disclosure (openness) in LPT is equivalent to admitting weakness and mistakes in FDT Similarly; *availability* (LPT) is relevant to asking for help (FDT). Demonstration of expertise, Fear of Sanction and Discreetness (LPT) are equivalent to

Skills, Taking risks and mutual respect respectively. All the attributes of FDT model falls under the category of *Absence of Trust*.

Finally, competence and benevolence in LPT model relates the avoidance of accountability and absence of trust in the FDT model. These similarities in these different models prove that all those attributes do matter to build trust in an organizational context.

The Prusack Trust model	The Five Dysfunctions of a Team
Closeness	Avoidance of Accountability
Frequency	Fear of conflict

The Prusack Trust model	The Five Dysfunctions of a Team
Personal Disclosure (Openness)	Absence of Trust — Admit weakness and mistakes (confession); Ask for help; Skills and experience; Take risks; Mutual respect
Availability	
Demonstration of expertise	
Fear of Sanction	
Discreetness	

The Prusack Trust model	The Five Dysfunctions of a Team
Competence	Avoidance of Accountability
Benevolence	The Absence of Trust

Fig 7: The comparison of Larry Prusack s' (2001) to The Five Dysfunctions of a Team model.

2.5 Successful virtual team environment

So, how does a successful team environment looks like? As per *the model* of *The Five Dysfunctions of a Team* (Patrick Lencioni, 2002), the members of truly cohesive teams behave as follows:

"1. They trust one another.
2. They engage in unfiltered conflict around ideas.
3. They commit to decisions and plans of action.

4. They hold one another accountable for delivering against those plans.
5. They focus on the achievement of collective results."
(Patrick Lencioni, 2002 p.189-190)

Although this model is developed for face-to-face work environment, one could easily comprehend that ideal virtual team environment would be similar as well. It is noteworthy that good communication and strong relationship building are fundamental to achieve that 'ideal' virtual environment (see figure 8).

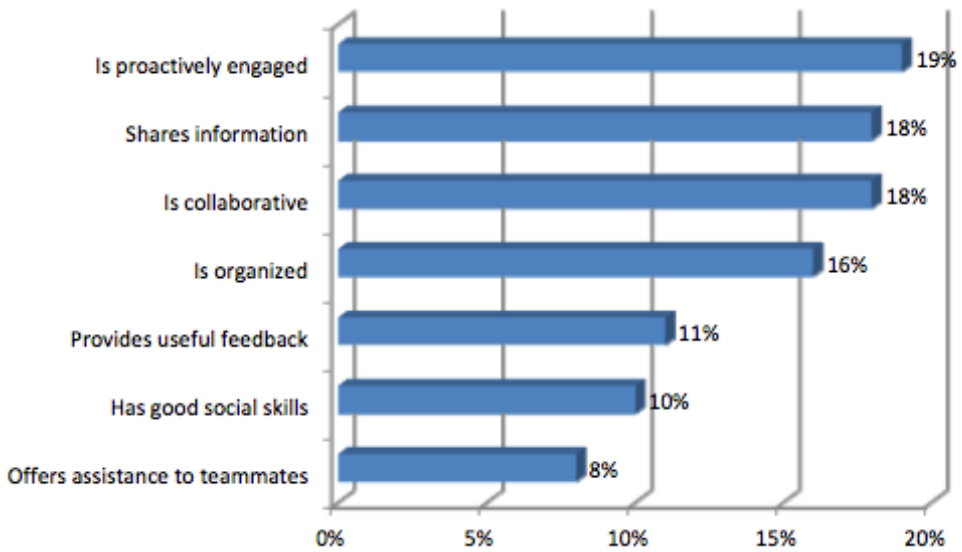


Fig 8: Characteristics of good virtual teammate (source: http://rw-3.com/)

Saunders' (2000) life cycle model for virtual teams describes the success indicators in virtual team environments (see figure 9). The model is divided into three stages: *input*, *process* and *output* and is discussed in Egea's case study (2006):

"For the Input stage, *design* refers to shared understanding of the team task, identification of strengths and weaknesses of team members; *culture* refers to personal environmental influences; *technical training* refers to knowledge of technology used by the team and is provided to help the team members understand interaction within a virtual content. The process stage has two sections, *socio- emotional* and *task*. The *socio-emotional* process stage refers to relations, trust and cohesion, which are all part of relational building within virtual teams. *Task* process refers to the task achievement and includes the communication and collaborative activity and the task-technology fit. Critical

here is the suitability of the fit between the team tasks and the technology that is used. The final stage, the Output stage, is described in terms of personal satisfaction and team performance, demonstrating the importance of the individual in teamwork tasks."
(Egea, 2006, p.82)

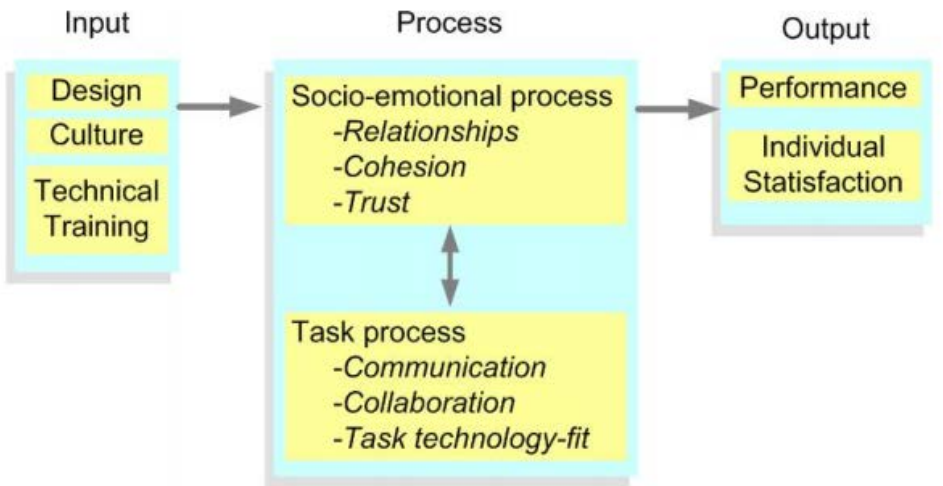


Fig 9: Saunders' (2000) Life cycle of virtual teams.

Egea's study, (2006) is based on Saunders' (2000) life cycle model and further describes various 'success' indicators for the successful virtual team environment. Besides, designing a balanced team, developing a good understanding on various cultures and having good technical competencies in the input stage were emphasized. For the process stage, 'success' indicators were described as below:

- "*Establishing social capital* (Pauleen 2004) in managing distant relationships is critical to team interactions. Inclusiveness in conversation builds a sense of community and trust (Kimble, Li, & Barlow 2004). Ongoing trust includes the identification of commonalities between members, performing competently, displaying concern between members and acting with integrity (Duarte & Snyder, 1999).

- Virtual teams have immense communication problems due to the lack of face-to-face interaction. It is critical that *contextual information* such as workload, personal perspectives, outside factors are considered, as they affect the teamwork conveyed to the virtual team (Loughran 2004).

- High performing teams built communication based on *social exchanges* and coped with technical and task uncertainty (Jarvenpaa & Leidner, 1999)."
  (Egea, 2006, p.83)

Using these guides for team success, three social mechanisms (Preece et al. 2002) for communication and collaboration were used in Egea's study; *Conversation*, *Awareness* and *Coordination:*

- "*Conversation* is how people carry on a discussion. One needs to consider the rules of interaction, the implicit or explicit cues, formal or informal language, and type of interaction (synchronous or asynchronous), number of people in the conversation and dealing with breakdowns and repair mechanisms that may be required.

- *Awareness* refers to the observations we make when in a collaborative space such as who is around, what is happening, and who is speaking to whom" (Preece et al. 2002, p.124).

- *Coordination* includes examination of shared understandings, schedules, rules and conventions that are used and external representations. Coordination takes place when a group of people act or interact together to achieve something. Collaborative activities require team members to coordinate with each other."
  (Egea, 2006, p.84)

In the study, off-campus students in an undergraduate course utilize the themes of conversation, awareness and coordination and document their reflection on their use over the team lifecycle (Egea, 2006):

> "All functioning teams indicated that these social mechanisms helped to build team trust and commitment. Seventy-two percent of students indicated positive team experience, despite constraints of workload, time pressure, technology tools, distance and uncooperative team members. This study argues that use of guided and iterative reflections on social mechanisms

support virtual team functioning and strengthen relationships."
(Egea, 2006, p.81)

"The focus on the communication and collaboration for virtual interaction has been built on technological usage, with limited attention to importance of social relationships in teamwork" (Egea, 2006, p.81; Henttonen & Blomqvist, 2005). Preece et al (2002, p.105) further argue that "human are inherently social. It seems only natural, therefore, to develop interactive strategies that support and extend these different kinds of sociality." "This same argument is used to develop social strategy for relationship building in virtual teamwork" (Egea, 2006, p.84).

Chapter 3: Human-Centered Design

3.0 Introduction

This section emphasizes on the concept of Human-centered design and the importance of user experience while designing interactions for products, systems, services and environments.

3.1 Human- Centred design

"Human-centered design has been defined as a methodology that puts users at the centre of the design process" (Norman, 1998; Buchanan, 2001).

Figure 10 (left): Example of a cognitively intuitive design: "Bathe Safe" by Oliver Wooderson utilizes a large colour screen to monitor bath temperature to avoid the dangers of scalding. Colors, typography and visuals combine to render the situation cognitively obvious. (Giacomin, 2012).
Figure 11 (right): The fun theory- Piano stairway encourages commuters to ditch the escalators at Odenplan subway in Stockholm, Sweden. A nifty way of encouraging people to exercise more...turning a not so pleasant activity to a joyful one!

Giacomin (2012) further elaborates on Human-centered design in the following description:

> "Today's human centered design is based on the use of techniques which communicate, interact, empathize and stimulate the people involved, obtaining an understanding of their needs, desires and experiences which often transcends that which the people themselves actually realized. Practiced

> in its most basic form, human centered design leads to products, systems and services which are physically, perceptually, cognitively and emotionally intuitive."
> (Giacomin, 2012, pp.3-4)

3.2 User Experience

Understanding user experience is at the core of human-centred design. According to ISO standards, user experience is defined as "a person's perceptions and responses that result from the use or anticipated use of a product, system or service." Christian Craft (2012) simplifies user experience as the feelings (i.e. emotion) that the user gets while using a product. "Using feelings as a comparison model allows us to understand that the user experience can be anything from hate to love. From anger to happiness, indifference to passion, expectancy to nostalgia, pride to humiliation and so forth" (Christian Craft 2012, chapter 1, p.1).

3.2.1 User Experience Curve

Christian Craft explains in his book (User Experience Innovation: User Centered Design that Works, 2012) about the "User Experience Curve" which is basically the feelings that the users have in different situations while using a product (see figure 12):

> "Positive feelings mean that the user experience curve goes up and negative feelings mean that the curve goes down... And as with a personal relationship with a product, the feelings may change over time, or even from day to day. Certain things may even make us go from happiness to anger in just seconds (e.g., if a software program crashes when you have just been using it for an hour, typing a long letter). Other things may become annoying to use when the user knows that there are better solutions out there. The goal is of course to maximize the positive moments for users when they're using your product... another very important element— is to eliminate the worst negative feelings during usage of a product. One negative user experience may need ten good experiences to make the user happy again."
> (Christian Craft 2012, chapter 1, pp.1-2)

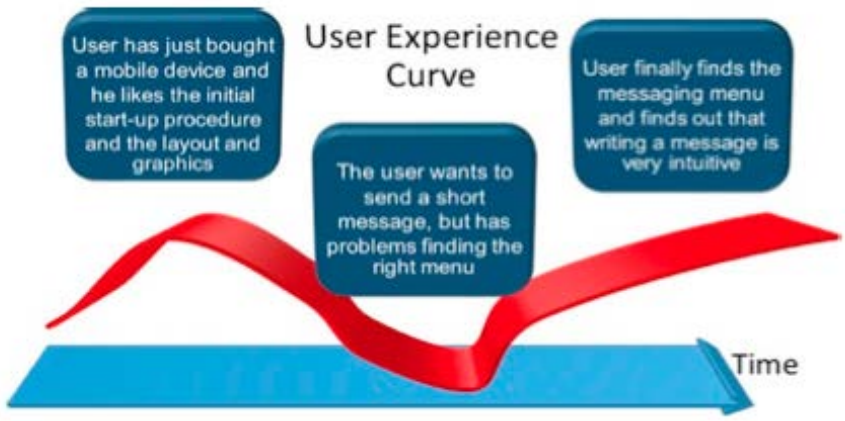


Fig 12: User Experience Curve example (source: User Experience Innovation: User Centered Design that Works, 2012)

Michael Minge (2008) discusses another approach for defining the concept of user experience, which "is to characterize specific dimensions that are important aspects in the experience of technology" (see figure 13):

> "For this purpose, Hassenzahl (2005) distinguishes two dimensions of product qualities, namely the perception of instrumental (or: 'pragmatic') and non-instrumental (or: 'hedonic") qualities. Whereas the first refer to performance and pure usability aspects, the latter summarize system properties, which refer to beauty, visual aesthetics, identification and stimulation."
> (Minge 2008, p.1)

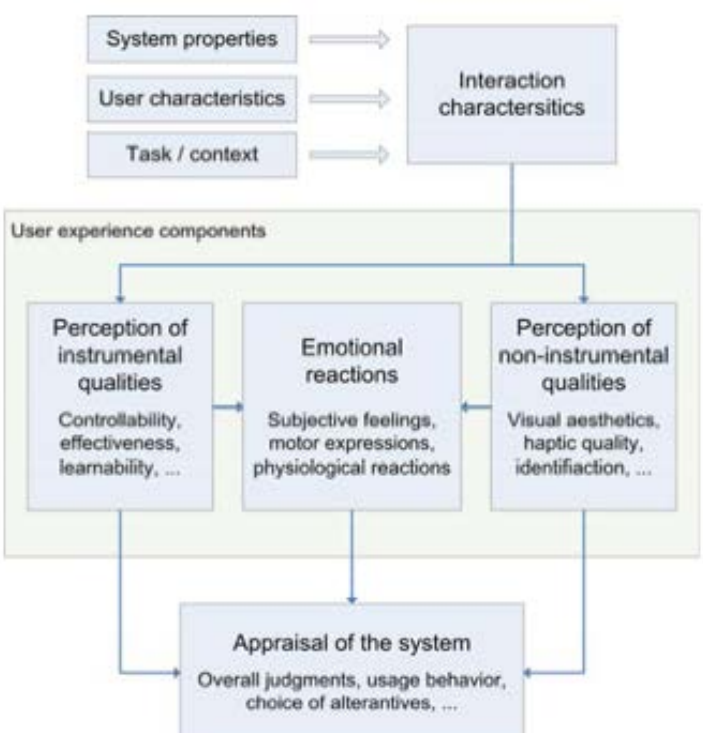


Fig13: Components of user experience (CUE-Model)

Michael Minge's (2008) further states the following:

> "The importance of those aspects is motivated by their immediate perceptibility": While usability evaluation depends basically on interaction with the product, the attributes that enable hedonic judgments are immanent in the product appearance itself.
> A third important aspect of user experience is emotional user reactions. For example, Jordan (2000) distinguishes several types of pleasure with a product, whereby he insists on high functionality and high usability as necessary preconditions."
> (Minge 2008, p.1)

3.2.2 User Experience in Interactive system

A number of models and theoretical approaches have been developed to help understand 'experience'. To understand the user experience in interactive systems, an interaction-based framework (Forlizzi and Battarbee, 2008) can be used (see figure 14). The framework focuses on *interactions* between individuals and products and the *experiences* that result.

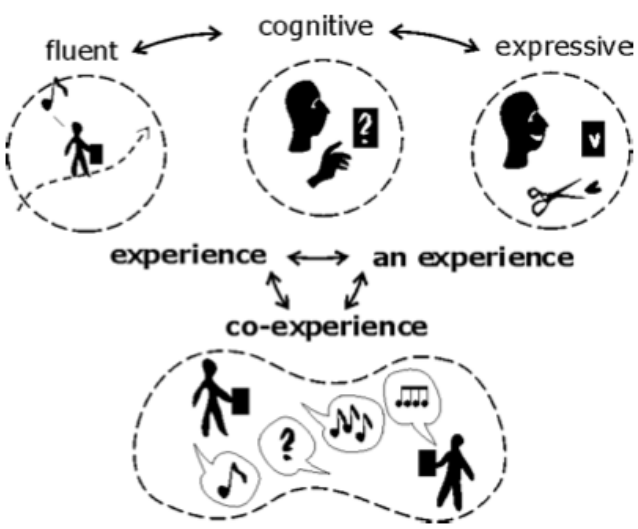


Fig14: The user-product interactions and the dynamics of experience in interaction for individuals and in social interaction Source: (Forlizzi and Battarbee, 2008)

For a better understanding of the user-product interactions and the dynamics of experience, the following table 1 and 2 below has been presented. Table 1 describes user-product interactions (fluent, cognitive, and expressive) with relevant examples (see next page). Additionally, it stresses the importance of these experiences in the context of social interaction, in which people interpret particular events and create meanings. The framework of dimensions of experiences- *experience,* an *experience* and *co- experience* can be seen in table 2.

Types of User-Product Interactions	**Description**	**Example**
Fluent	Automatic and skilled interactions with products	• Riding a bicycle • Making the morning coffee • Checking the calendar by glancing at the PDA
Cognitive	Interactions that focus on the product at hand; result in knowledge or confusion and error	• Trying to identify the flushing mechanism of a toilet in a foreign country • Using online algebra tutor to solve a math problem
Expressive	Interactions that help the user form a relationship to the product	• Restoring a chair and painting it a different color • Setting background images for mobile phones • Creating workarounds in complex software

Table 1: A framework of user experience as it relates to the design of interactive systems- Three types of user-product interactions. Source: (Forlizzi and Battarbee, 2008).

Types of Experience	Description	Example
Experience	Constant stream of "self-talk" that happens when we interact with products	• Riding a bicycle • Making the morning coffee • Checking the calendar by glancing at the PDA
An Experience	Can be articulated or named; has a beginning and end; inspires behavioral and emotional change	• Trying to identify the flushing mechanism of a toilet in a foreign country • Using online algebra tutor to solve a math problem
Co-Experience	Creating meaning and emotion together through product use	• Interacting with others with a museum exhibit • Commenting on a friend's remodeled kitchen • Playing a mobile messaging game with friends

Table 2: Three types of experience. Source: (Forlizzi and Battarbee, 2008).

3.3 Changes in User Experience over time

According to User experience study (Minge, 2008), there are "overshadowing effects of 'hedonic' aspects, i.e. attractiveness over 'pragmatic' aspects, i.e. usability. People use apparent qualities of a product to estimate non-evident attributes, i.e. usability" (Minge, 2008, p.5). Furthermore, this overshadowing decreases over time, so that people "value the usability quite independently after a relative short interval of interaction" (Minge, 2008, p.5). The judgments of attractiveness are negatively "influenced by the perceived usability in case of low usability" (Minge, 2008, p.5). The overshadowing effect is quite rather opposite in this case. People "'punish' the attractiveness of a technical system because of perceived flaws in usability" (Minge, 2008, p.5).

The relationships between emotional user reactions and system properties are also studied. Emotions were strongly influenced by usability aspects and less by the level of attractiveness. Finally, Minge's study shows:

> "Not only judgments change over time, but also underlying motivations. At the beginning, usability ratings are focused on goal conduciveness and later on more general using aspects. Attractiveness judgments are first related to novelty and later to aspects that consider on the previous interaction, e.g. fascination."
> (Minge, 2008, p.5)

Chapter 4: Empirical study at Volvo IT

4.0 Introduction

This section investigates the usage of collaboration tools at Volvo IT, through methods carried out like observations and a survey. The chapter ends with findings from the conducted survey questions and the empirical study is to be compared with rest of the thesis.

4.1 Volvo Information Technology

Volvo IT is a Global company that is well known for being one of the biggest suppliers of commercial transport solutions and is a part of the Volvo Group. They offer top quality IT solutions, consulting services, as well as services revolving around telematics. The company has more than 40 years of experience in providing the Volvo Group with IT based solutions and has helped to make Volvo a leading user of information technology within the automotive industry. Moreover, having their headquarters in Torslanda-Sweden, Volvo IT is well established in over 35 locations globally and has approximately 6000 employees in places such as Sweden (headquarters in Torslanda-Gothenburg, Skövde, Olofström,), Poland (Wrocław), Belgium (Ghent), France (Lyon), United States (Greensboro), India (Bangalore), Malaysia (Kuala Lumpur), Northern China (Tianjin) and Brazil (Curitiba) etc. This makes them efficiently deliver IT solutions to customers in various of industries.

4.2 Methodology

4.2.1 Observation

The empirical study includes observing online meetings and workshops of collaboration team which was followed by a questionnaire survey and interview of the team members. The purpose was to understand the work process and usage of collaboration tools to identify the limitations, potential tool dynamics and the user experience.

We participated in two global workshops at Volvo IT Torslanda headquarters as observers. Figure 15 shows the top view of the participants and the devices used during virtual collaboration. The workshops were approximately two hours long each with 15 minutes breaks in between. We took notes on different usability and operational issues

during the workshop as well as interviewed the concerned employees to get a better grasp of the situation.

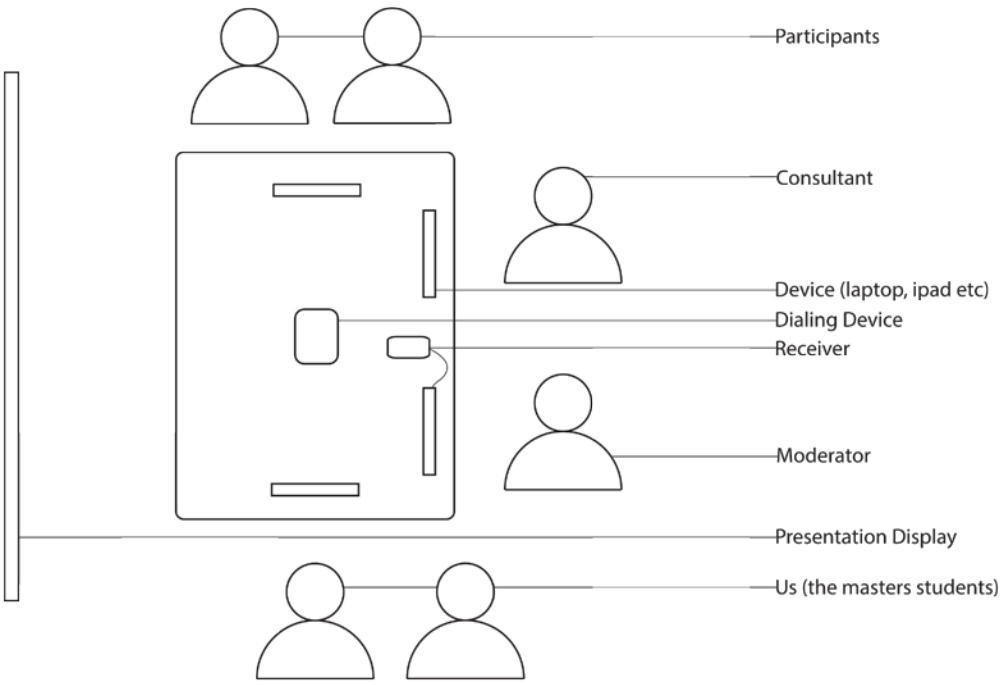


Figure 15: The very first workshop environment (February 2013).

The tools used during the workshops were Microsoft Lync for instant communication (see figure 16), Microsoft SharePoint (Figure 17) for storing and sharing documents, Microsoft Outlook for emailing, sending meeting invitation and calendar events as well as Microsoft PowerPoint for presentation purposes. We were also told that video conference was used less frequently compared to other means of communication. The settings of the meetings were a combination of both virtual (the dispersed team members) and face- to-face (The collaboration team present at Volvo IT Torslanda).

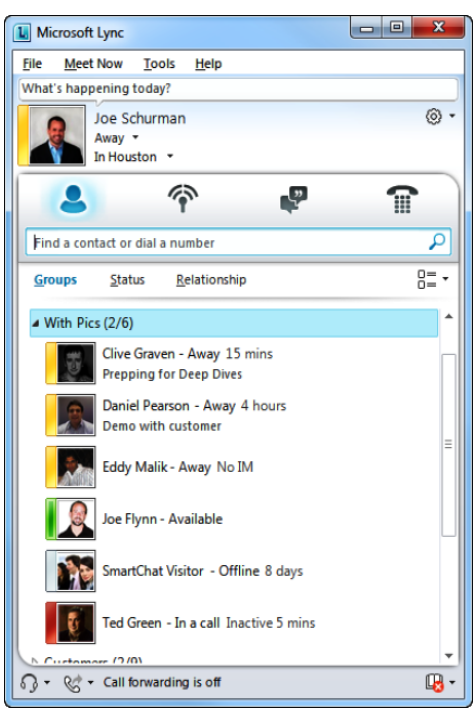


Figure 16: The Lync GUI.

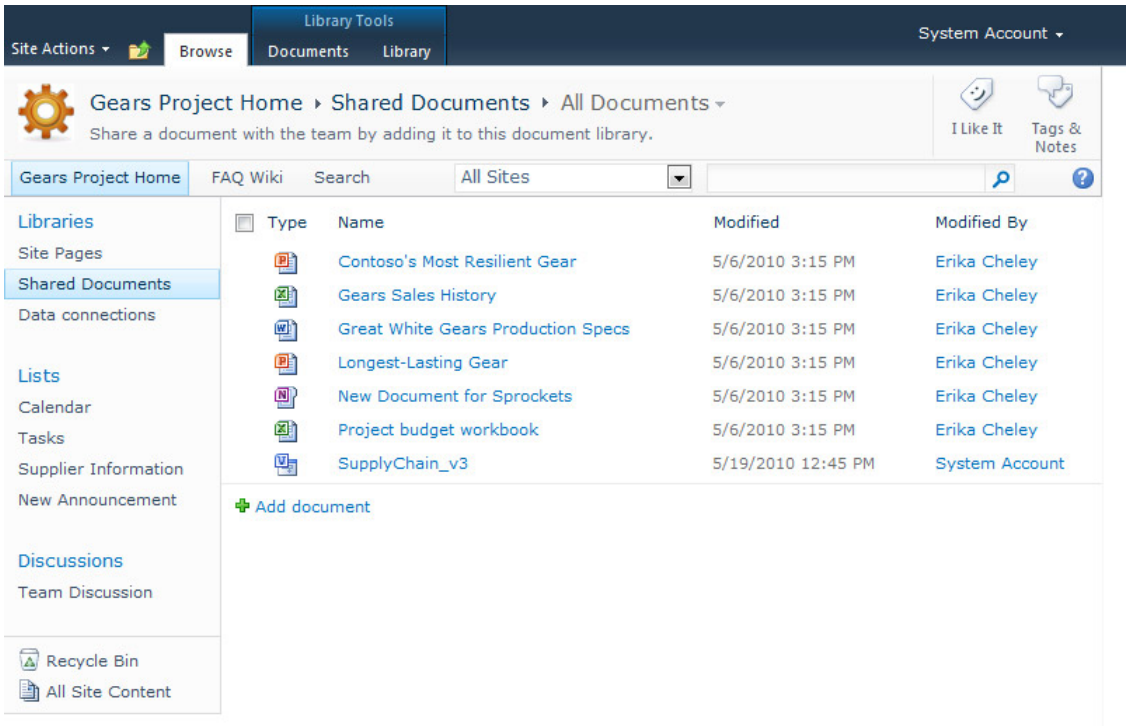


Figure 17: Example of Sharepoint GUI.

4.2.1.1 Observation Results

Some of the findings from the observation are discussed below:

4.2.1.1.1 Excise

Excise is the number of extra steps or clicks to accomplish a task (Cooper et al, About Face 3: The Essentials of Interaction Design, 2007). We noticed significant amount of excise due to the lack of one unified tool for calling the contacts, checking the meeting presence and connectivity, taking notes from conversation, sending invites/calendar events and such. All these different activities were being handled by different tools mentioned earlier. So there happened to be a lot of switching in between windows- which was certainly an unpleasant experience evoking a mixed feeling of annoyance and confusion.

4.2.1.1.2 Lack of Attention

In case of overseas calling and running meetings through voip, *lack of sustained attention* was noticed due to the lack of enough visual cues from remote team members. One of the reasons could be the unclear transmission of voices. For example, while expecting some kind of reply from the other side and when there was silence for a prolonged period of time, the facilitator had to check the presence by asking for audible feedback– 'Are you there?' Moreover, the transmitted voice failed to keep up the listeners' interest as the sound loses its natural settings and originality over the transmission line.

4.2.1.1.3 Lack of social engagement

The traditional collaboration tools don't have unobtrusive and continuous way of engaging into open discussions with interesting contents by the peers (e.g. social networks are best examples for this, however, in case of work the discussions could be related to work) with remote colleagues during the working hours. The meeting sessions or workshops are only aimed for work related activities and formal personal exchanges such as- 'checking in' in the beginning of a meeting where the participants talk few words about how are they feeling?, what is interesting for the day? And so on, which has a tendency to become a routine activity over time and eventually become less interesting. We started this study by exploring new ways of using the collaboration tools to improve trust within virtual team members. However, one problem became very apparent which was– 'failure to communicate' and it should not be confused with communication skills. Most of these above mentioned issues were found from observation related to usability problem of using the tools. So, we thought of an ideal scenario where there was no excise, no lack of attention. Would it be possible to achieve high trust in virtual collaboration in that case? This is what led us to shift our focus from fixing the usability problems to a broader opening which is more established in the face-to-face working environment and naturally more human-centered–socializing. Social communication is the way to improve interpersonal relationships and group cohesion that can lead to high trust. Later, we wanted to investigate what other tools are available that could facilitate socializing and that eventually lead us to the teamplace discussion forum. However, we came to learn that there has not been any real use of that forum for the last ten years (Figure 18). Teamplace discussion forum was way more basic than a standard internet forum in terms of feature richness and interaction capabilities. We wanted to find out whether this forum could add any value to the daily workflow at Volvo IT and also what the collaboration team members actually thought about this tool.

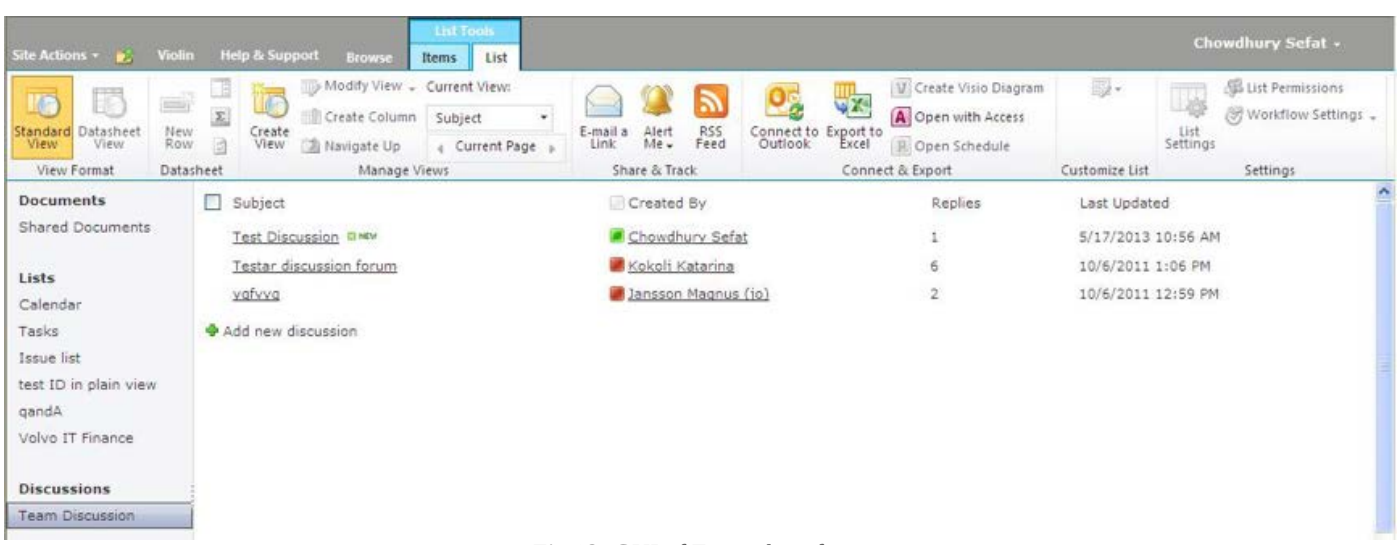


Fig 18: GUI of Teamplace forum.

4.2.2 Survey

We created the survey to evaluate the current tools used at Volvo IT to get an overview of what tools are being used, the interaction that takes place, the behaviors towards the tools being used and additionally to understand the daily communication traffic. The survey was made using the web-tool Qualtrics[2].The survey questions and results are available at the appendix section (see Appendix A & B). The survey was sent to 34 participants in the Volvo collaboration team across multiple countries including France, United States, India, Malaysia, Brazil etc. It was active online for seven days where 25 participants responded to the survey and the average age range of the participants was 35-40 years, with a maximum age of 52 years and a minimum age of 24 years.

The findings from the survey questions are discussed below and show the use percentage of the various tools:

Finding #1

- 92% of the users have previous experience in interacting in online discussion forums.

Finding #2

- Email (42%) was the most used tool followed by instant messenger Lync (27%) and audio talk by calling (22%). Teamplace discussion forum was only used for 1 % (see figure 19).

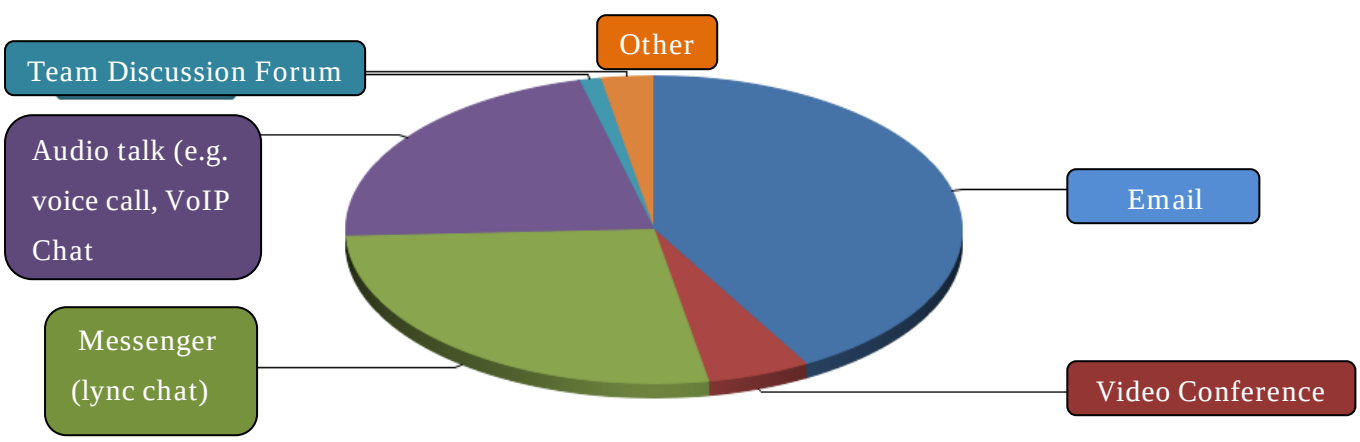


Fig 19: Usage of collaboration tools at Volvo IT

2. Qualtrics: http://www.qualtrics.com/

Finding #3

- 51% of the emails have single recipient, 49% have multiple recipients.

Finding #4

- 51% of the emails are just simple exchange of information and 49% require careful and thoughtful thinking.

Finding #5

- 24% of the users receive more than 40 emails per day, 10% of the users received 30-40 emails, 29% of the users receive 21-30 emails and 38% of the users receive 11-20 emails per day.

Finding #6

- 29% of the employees answered that they always need to read entire conversations of emails, 52% of the employees answered that they very often read the entire conversations and 19% of the employees occasionally need to read all conversations.

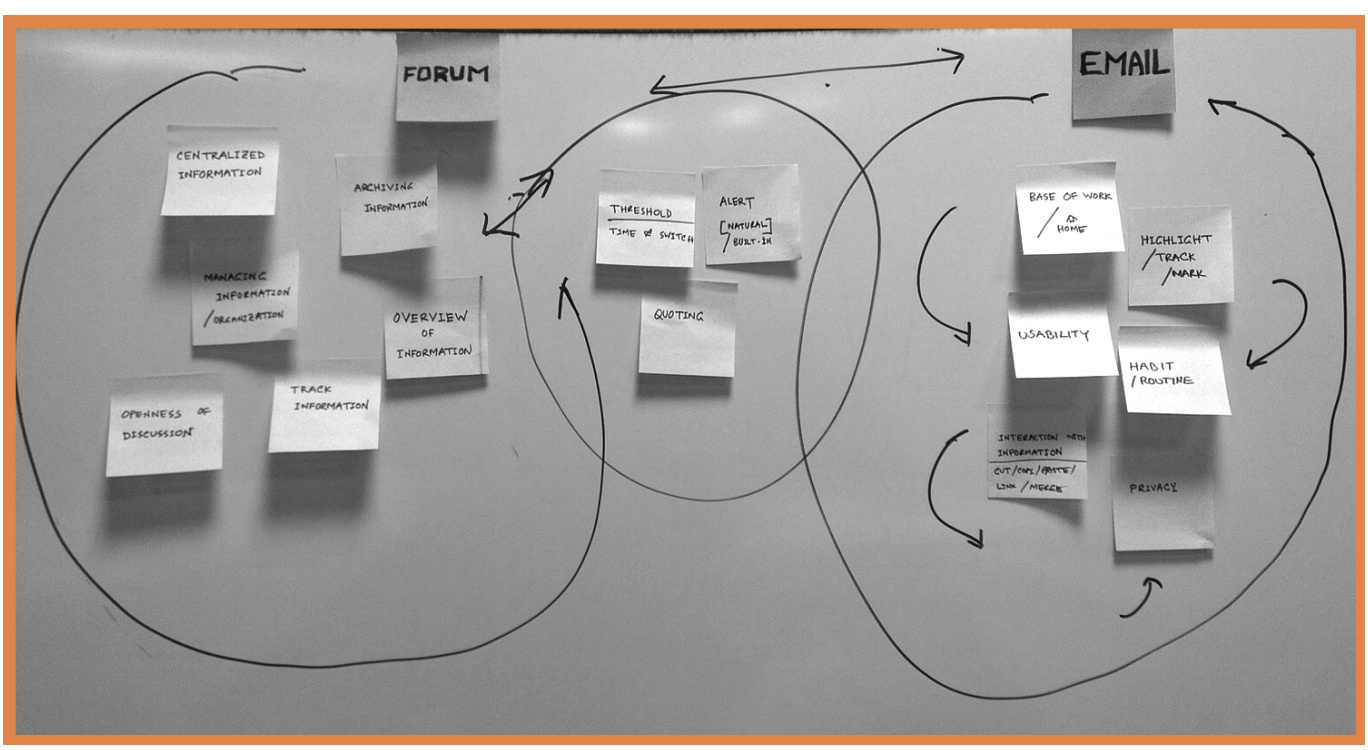


Fig 20: Interaction analysis of feedbacks received on Email and Discussion forums

Finding #7

Using the Affinity diagram presented above (see figure 20), we categorized the different comments from the survey's final question (see Appendix A) to explore the participants opinions about Microsoft Outlook and the current discussion forum at Volvo IT. Particularly, we investigated the pros and cons of these tools. Most of the users think discussion forum is great because it is easier to get an overview of all the conversations. The conversations are stored and organized at one place but the teamplace forum threads are not very easy to follow (see participants' comments below).

> *"In a discussion forum I think it´s easier to get an easy overview of the conversation. In an email it can sometimes be harder to follow a long conversation."*

> *"Easier to track and get an overview of the conversation, easier to involve several parties in the dialogue."*

> *"Discussion forms looks old, options threaded/flat not like any PHP forum on internet."*

However, users also think notification is important when it comes to following forum interaction and there should be ways to mark/unmark conversations as read/unread. Also, there is no way to know whether the intended persons have seen/read the post or not (see participants' comments below).

> *"Harder to insure that all involved parties notices new postings. Harder to get clear endings/closure of the discussion from all parties."*

> *"No alert of replies (at least not by default in Teamplace - must set up own alert), no indication of what I have read/not read, no ability to mark replies/conversations I find important to me."*

Team Place (SharePoint) discussion forum is not built on latest web technologies and hence sluggish while interacting with its graphical user interface (GUI).
On the other hand, people prefer using email because it easier to use email as the central communication point and email is seemingly faster. Moreover, users don't need to switch to other tools that make email to be considered/perceived as a 'unified tool'.

The other benefit that email has over discussion forum is that email has a ‘push’ style of communication (new items are presented to the user automatically) whereas forum has a ‘pull’ style (see participants’ comments below).

> *"We are more familiar in checking our emails on a regular basis, which means that there could be a treshold if people do not go into the discussion forum as regularly."*

> *"The pros for email is that my working desk is Outlook, that's my base of information. I prefer getting information in email since I'd feel that going elsewhere to look for it would be out of my way, so to say."*

These findings from the survey provided us with new requirements to support the online collaboration and meet the user needs.

Chapter 5: Web 2.0 and Social networks

5.0 Introduction

In this chapter, we explain the concept of web 2.0 and social media that revolutionized the way we interact on Internet. It has also changed the way a whole generation of people thinks about interacting and what users do online to emulate their daily offline activities such as socializing with friends, engage in hobbies, studying etc. (Simon Wright & Juraj Zdinak 2013).

5.1 Web 2.0

The concept of Web 2.0 (see figure 21) was first introduced in 2004 by Tim O'Reilly and MediaLive International. "The Web 2.0 concept was developed to express the new evolving trends of web" (Annika Valtar 2009, p.4). As Tim O'Reilly (2006) defines it:

> "Web 2.0 is a set of social, economic and technology trends that collectively form the basis for the next generation of the internet – a more mature, distinct medium characterized by user participation, openness and network effects." (Tim O'Reilly, 2006, p.4)

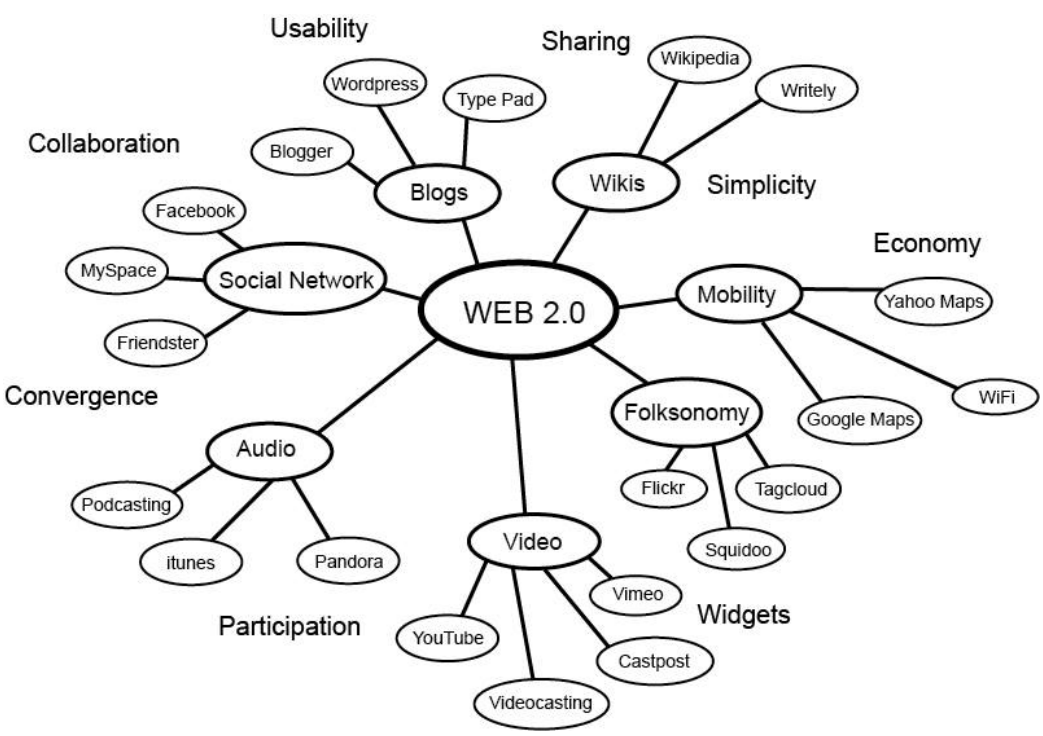


Fig 21: web 2.0 tools.

In a P2P network, the "peers" are computer systems which are connected to each other via the Internet. Files can be directly shared between systems on the network without the need of a central server.

Web 2.0 is the successor of traditional web, which is often called Web 1.0. Web 2.0 uses web as an application platform and thrive on *User generated content* (UGC). Web syndication (a form of syndication in which newly added web materials of a website are made available to multiple other sites), Peer-to-peer communications (a direct communication approach where the peers are the computer systems or the end users of a distributed network) and Folksonomy (“the practice and method of collaboratively creating and managing tags to annotate and categorize content” (S Beldjoudi et al., 2011, p.1) such as *Tags* associated with a YouTube video upload), are some of the web 2.0 characteristics. “Social web is the broadest Web 2.0 characteristic, and it includes user participation and social networking” (Valtari 2009, p.4). Moreover, “Web 2.0 is more dynamic and interactive” (Murugesan, San, 2007, p.34). New web technologies such as Adobe Flex and Ajax “enable Web 2.0 user interfaces to be richer and more responsive than Web 1.0 interfaces” (Valtari 2009, p.6). Based on Murugesan, San (2007) and Young, G. Oliver (2007), Valtari further elaborates on explaining Web 2.0:

> “Web 2.0 concentrates on collaborative content creation and modification and connects people with similar interests through social networks. Web 2.0 has changed the ways in which especially young and technology- oriented users interact with each other and also the content of web.”
> (Valtari, 2009, p.6).

5.2 Web 1.0 vs Web 2.0

Cormode and Krishnamurthy (2008) discuss the difference between Web 1.0 and Web 2.0 (see figure 22) and have explained this in the following way:

> “The essential difference between Web 1.0 and Web 2.0 is that content creators were few in Web 1.0 with the vast majority of users simply acting as consumers of content, while any participant can be a content creator in Web 2.0 and numerous technological aids have been created to maximize the potential for content creation. The democratic nature of Web 2.0 is exemplified by creations of large number of niche groups (collections of

friends) who can exchange content of any kind (text, audio, and video) and tag, comment, and link to both intra–group and extra–group 'pages'. A popular innovation in Web 2.0 is 'mashups,' which combine or render content in novel forms. For example, street addresses present in a classified advertisement database are linked with a map Web site to visualize the locations. Such cross–site linkage captures the generic concept of creating additional links between records of any semi–structured database with another database."
(Cormode and Krishnamurthy, 2008, p. 2).

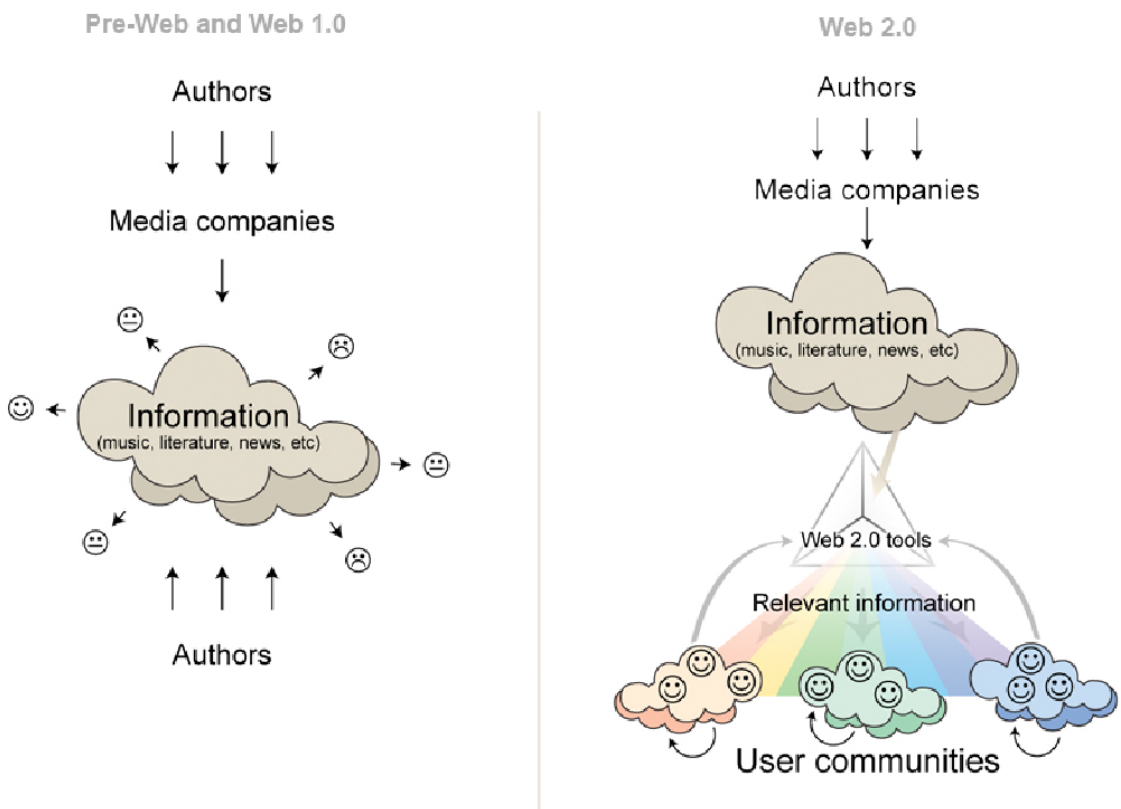


Fig 22: Comparison between web 1.0 and web 2.0 based on information flow. In, web 1.0 was controlled by media companies and few authors. On the other hand, web 2.0, information flow is managed (filtered, rated, and sorted) by user communities (peers with matching interests) (image source: http://yarikson.files.wordpress.com/2008/04/web-20-scheme.png)

5.3 Social networks

There has in recent years “been an explosion in the number of Social Web sites which allow the creation of knowledge through simplified user contributions via blogs, wikis and the deployment of online social networks” (S Kinsella et al. , 2009, p.1). “Social networking is the building of online communities. Online social networking services provide a variety of ways for members to interact from emailing to instant messaging” (Vishwakarma et al. 2008, p.1) to photo tagging. The most popular sites provide a way to connect with friends through multiple interaction methods. A Social network (see figure 23) is defined by Encyclopedia Britannica Online (2013) as “online communities of individuals who exchange messages, share information, and, in some cases, cooperate on joint activities”. Social networking applications and websites support the maintenance of personal relationships (Anria Sophia van Zyl 2009, p.7). Furthermore, A.Darwish, K.Lakhtaria, (2011) discusses about Social networks, which they have described as:

> “Social networks are software that supports collaboration, knowledge sharing, interaction and communication of users from different places who come together with a common interest, need or goal. Social networks are also known as range of applications that augments group interactions and shared spaces for collaboration, social connections, and aggregates information exchanges in a web-based environment “. Social networks can also be viewed as, for example, pedagogical tools that stem from their affordances of information discovery and sharing, attracting and supporting networks of people and facilitating connections between them, engaging users in informal learning and creative, expressive forms of behavior and identity seeking, while developing a range of digital illiteracies.”
> (A.Darwish, K.Lakhtaria, 2011, p.208)

One good example of a social networking service is Facebook, which is a popular web 2.0 service used extensively to communicate and interact online amongst friends, colleagues and other acquaintances. In the next subsection, we look into Facebook, which is currently the most popular social networking website (Darwish and Lakhtaria, 2011).

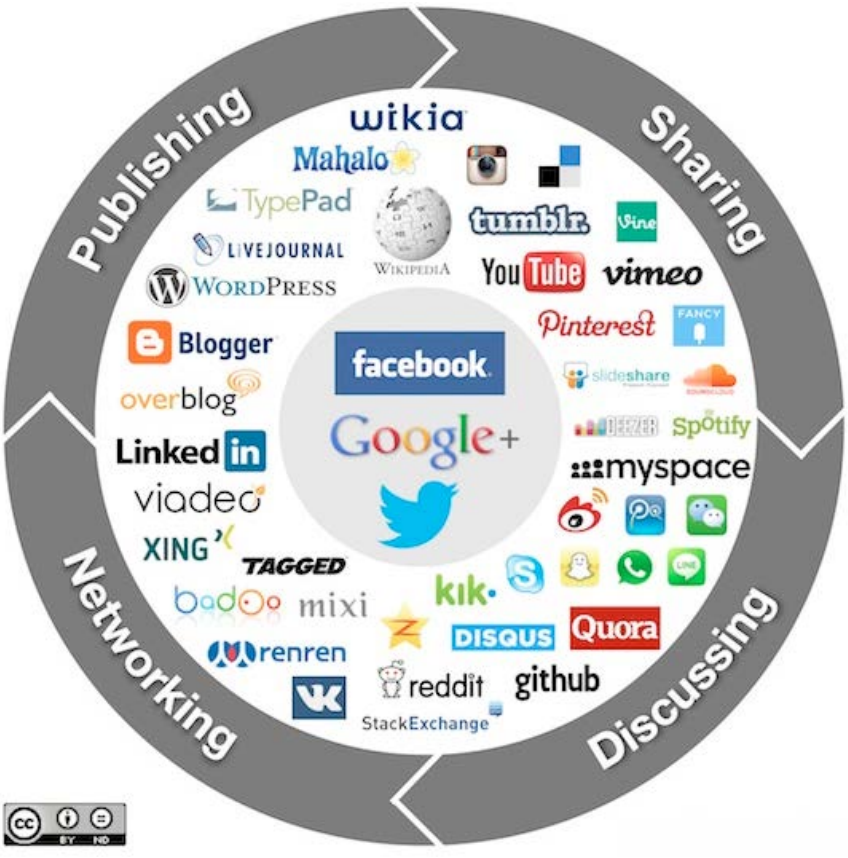


Fig 23: Online Social network landscape 2013 (image source: http://www.fredcavazza.net/2013/04/17/social-media-landscape-2013)

5.4 The Facebook Experience

Why are social networking sites like Facebook so popular and successful? In a study by Hart et al. (2008), "the investigation of Facebook's user experiences were performed in the light of two theoretical frameworks: McCarthy and Wright (2004) and Jordan's Four Pleasures (2002)" (Hart et al. 2008, p.2). In the study, they emphasize on the aspects with most significance to Facebook's success, which has been outlined below:

> "One of the most popular reasons for both joining and continuing to use Facebook was social reasons. Jordan (2002) identifies 'Socio- Pleasure' as one of the four pleasures (along with Physio- Pleasure, Psycho-Pleasure and Ideo-Pleasure) that makes for an enjoyable experience. As a social networking site, Facebook assists the facilitation of social interaction offering a plethora of methods of interacting with friends, which is one of the necessities of a social network. Human need for pleasure and fun is just as important as functionality and usability. Products should include the functional pragmatic

aspects as well as the positive ‘emotional’ and ‘hedonic’ user experiences to be successful.”
(Hart et al 2008, p.3).

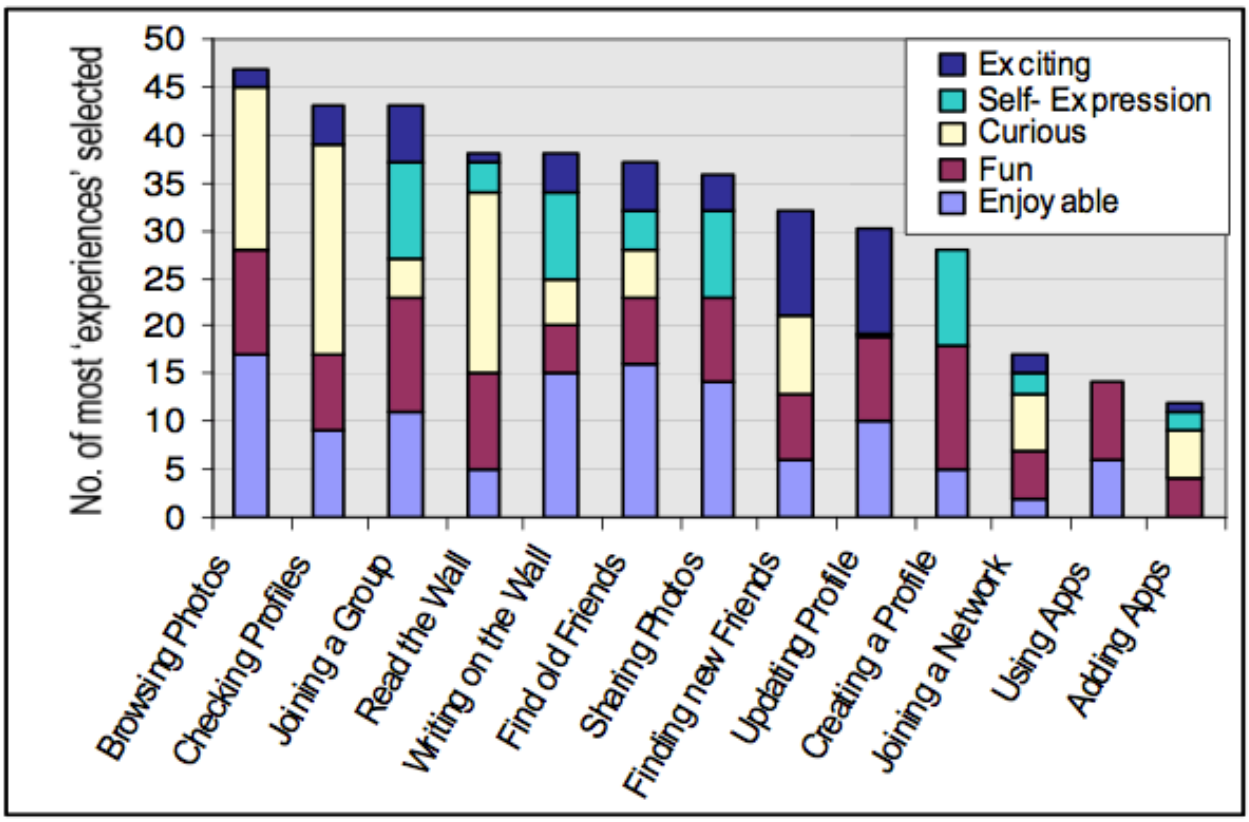


Fig 24: Facebook features rated for positive experiences

Curiosity is another aspect that Hart et al. (2008) mentions that "also emerged as another popular user experience and was often accompanied by fun, which can be a compelling motivator (see figure 24). Facebook takes advantage of curiosity by enticing users into finding out more about their peers through the numerous options on a profile page” (Hart et al., 2008, p.3).
In their study, they further describe the importance of a key feature related to ‘Social-Pleasure’:

> “The aspect of representing oneself to other people in a social situation was a key feature within Facebook, which allows its users to express themselves through the creation of personal profiles that can be shared with friends. This hedonic aspect of ‘Identification’ is similar to ‘Social-Pleasure’, which is that of

representing oneself to other people in a social situation (Hassenzahl, M. 2003; Jetter, H.C. et al. 2006)... Similar to Ideo-Pleasure, individuals can express themselves through communicating their identity as a personal form of self-expression which was very apparent in this study. However, there was a feeling of limitation and confinement reported with relation to creating unique profile pages and adding applications, which appears to de-motivate users to update or customize their pages any further."
(Hart et al. 2008, p.3)

5.5 Enterprise Social Network

This paradigm shift in the field of online collaboration has also created immense opportunity for social software application industry and new startup companies. Some of the notable applications are– Work by Salesforce (online social performance management tool), Chatter by Salesforce (Enterprise Social Network & Collaboration Software), Yammer– a highly potential enterprise social network startup project which was later acquired by Microsoft in 2012 (Lietdke, 2012).

Yammer (see figure 25) is a social network that focuses on the business and is primarily used for private communication within organizations. It is also possible to create external networks to allow non-employees, such as suppliers and customers for communication purposes.

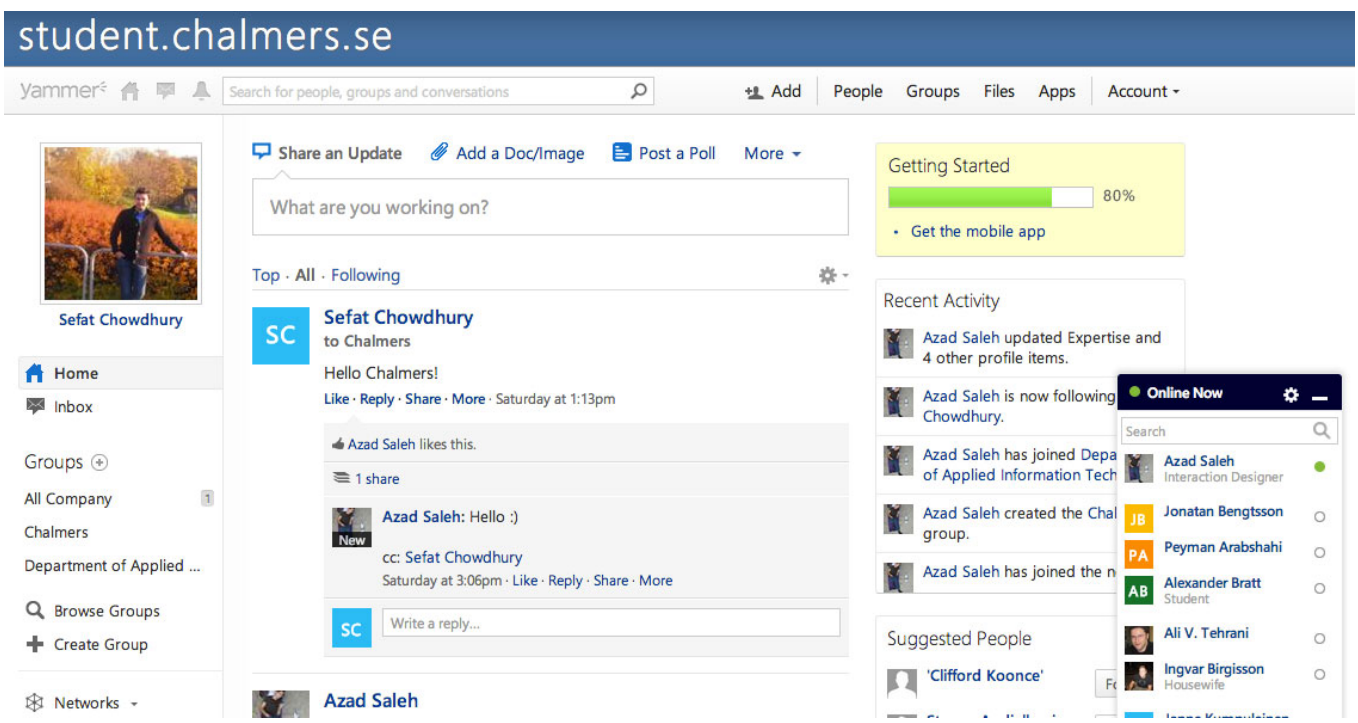


Fig 25 shows an example of the Yammer home page GUI.

Unlike consumer faced social networks (e.g. Facebook), Yammer does not share Customer Data with advertisers or anybody else. The new version of Yammer is aiming to become an all out social network for enterprises (Yammer 2013). Some of the most common features of Yammer include:

The Ticker

Like Facebook, user activities (new posts, status updates, comments) appear in Yammer's primary screen, which is known as the Recent Activity (see figure 26 to the right). Icons indicating private messages and other notifications appear in the upper left-hand corner (see figure 26 to the left).

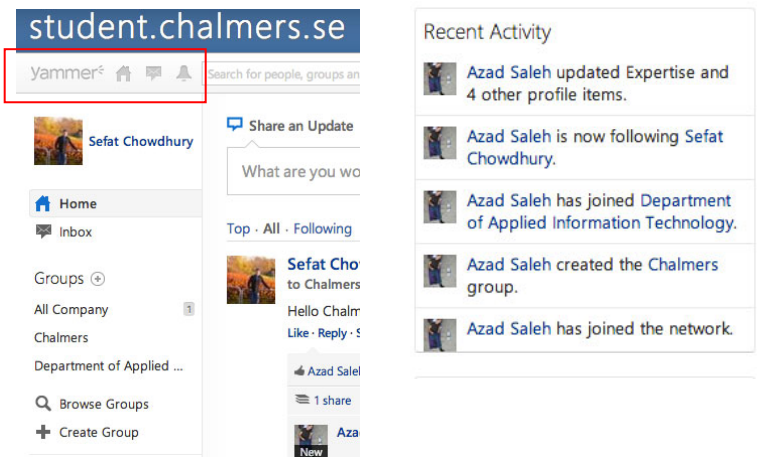


Fig 26 shows icons (home, inbox, notification) in the upper left hand corner and the recent activities to the right.

People Directory

Yammer has a people directory which automatically creates databases of the people registered at the site. This simplifies the search for contact information of the people in the company.

Sharing Files

Users can attach files to quickly share information without forcing recipients to search into cluttered inboxes (see figure 27). They can also upload various images and video files to a file repository, where other employees can download and update them.

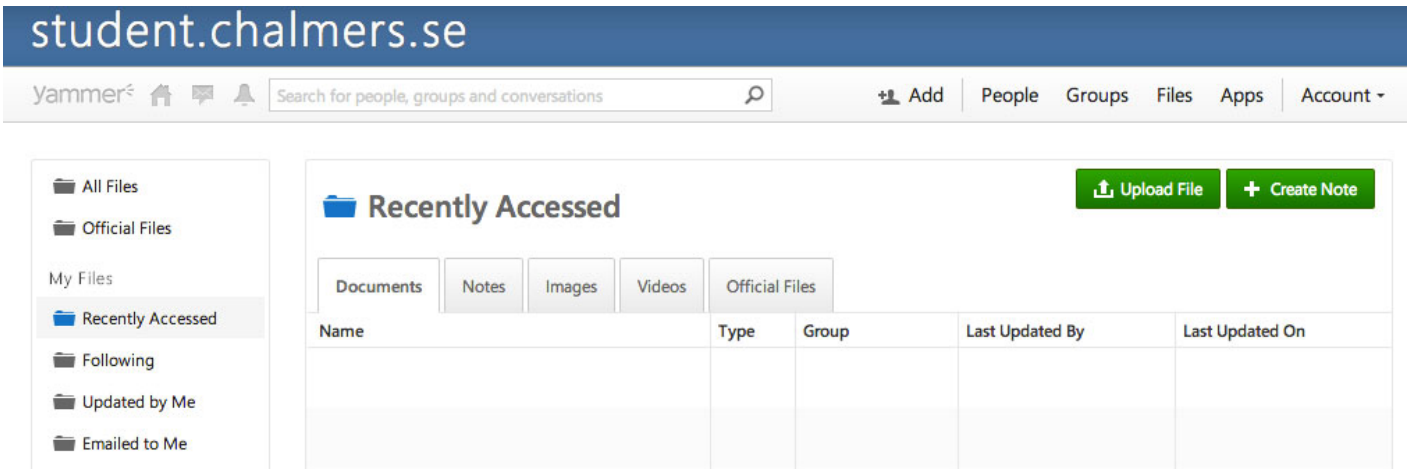


Fig 27 shows the file management section of Yammer.

Collaborating

Besides the previously mentioned file repository, "teams can collaboratively create pages (documents) in a group setting. Admins have the ability to lock down pages (and all other files) as official or read-only" (PCWorld 2012).

Mobile Platforms

Yammer supports apps for iOS, BlackBerry, Android and Windows Phone.

Less Email

"Yammer claims that companies using Yammer generate about 40 percent less email" (PCWorld 2012).

Integrated Messenger

Yammer includes an integrated messenger (see figure 28) placed at the right hand corner of the bottom screen.

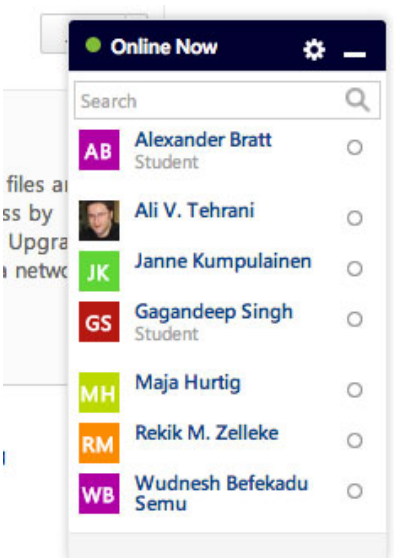


Fig 28 shows the instant messenger of Yammer.

Chapter 6: Results

In chapter 4, we discussed the findings from the observation and survey results at Volvo IT. In chapter 5, we discussed how web 2.0 and modern social networks have changed our attitude and the way we communicate online. In this chapter we combine these findings and talk about the concerning issues in the form of elicited requirements to help choosing the next collaboration tool that can support the user needs. In addition to that, we evaluate various social networking tools and conclude how well Yammer (Enterprise collaboration tool that we recommend) supports the elicited requirements.

6.0 Elicited Requirements

The elicited requirements are discussed below:

6.0.1 Change in communication behavior

Users of traditional communication media (phone based communication etc.) and face-face communication are now slowly shifting towards an internet that is globally enabled, where communication does not only happen regionally or locally, but rather worldwide. It is the influence of socio-economic changes that have been driving these social changes. The internet has taken over the role for changing trends instead of mass media such as newspapers; TV, radio, social circles and phone (Wright & Zdinak 2013). Furthermore, internet has increased the pace things are changing, having transformed into a powerful platform in a very short time, for innovations with rapid-speed that reaches out to a larger group of people. The present internet is focusing more on the user (user-focused). Simon Wright & Juraj Zdinak (2013, p.6) suggests that the change of communication behavior is mainly regarding the social communication, where technical communication devices have resulted in "more *collaboration*, *social interaction*, *personalization*, *active participation* and *communication*". These 5 mentioned factors or trends from their strategic white paper study have been summarized below as follows:

Collaboration

People are more active in developing knowledge and information beyond the use of traditional reference from e.g. encyclopedias, which are not seen as the main, single sources of information that is reliable anymore. Collaborative work has resulted in a

collective development of knowledge and information and more individuals have wider access to a broader range of global knowledge than former information sources.

Social interaction

The internet has made it possible for people to create and make most of their social circles, meaning that they stay connected in networked groups, which additionally allows them to expand these.

Personalization

People today require more personalized information. A good example of this is the change of the radio industry with several of niches in which each radio station focuses on a certain market, all due to the broadcasting possibilities, proving that the internet allows for communication worldwide, no matter the size of the niche.

Active participation

Since the Web 1.0 expired, people are no longer victims of passive information receival. Instead, people now want to share and contribute viewpoints and perspectives over the internet.

6.0.2 Change in Attitudes

In the previous requirement, we talked a little about the changing communication behaviors of users and the novel technologies that make this possible. However there is more to it than that. The fact that the internet has technologically evolved and changed the Web environment, has most importantly influenced the attitudes of the users, in a way that have increased the number of them to devote most of their time on the internet. Some examples of what they do online are fulfilling their entertainment, social needs and communication, all this becoming “a common activity for people around the world” (eMarketer 2013).

Furthermore, what users do online emulates their daily offline activities such as socializing with friends, engage in hobbies, studying etc. (Wright & Zdinak 2013). This allows for the buildup of communities in groups of people online and the freedom of choice of joining as many communities as wanted. Moreover, users are now contributing

and creating more than ever before, which can be seen in forums, blogs, various social networks, wikis, widgets etc.
The change in attitudes should be considered and can be seen below in Figure 29, taken from Simon Wright & Juraj Zdinak study for Alcatel-Lucent. They define modern web tool users as *User 2.0* and traditional web tool users as *User 1.0* to see the differences between them and how the use and technology have recently changed and evolved.

Comparison of User 1.0 and User 2.0

USER 1.0	USER 2.0
Passively reading and searching for content	Actively creating and sharing content online
Dependent on the content creator; not able to express own opinion	Can express opinions and even change the content presented
Usually using dial-up or first generation broadband connection	Usually using broadband internet connection, or even optical fibre
Getting the Web as it is	Customizing Web pages and content
Email is the main communication tool	Peer-to-peer programs are the main communication tools
The computer is the main access point	Able to connect from various devices
Logging on to the internet for time-limited sessions	Often connected online all the time

Fig 29 shows differences between modern web tool Users 2.0 and traditional web tool Users 1.0 (Simon Wright & Juraj Zdinak 2013.)

The Figure above shows us the benefits that users of web 2.0 have in comparison with Users of web 1.0:

- More freedom and simplicity in the interactions performed due to diverse tools and customizable web technology.
- Greater democracy in terms of expressing opinions and change of web content, hence a much more social environment.
- Consistent network connection and support for connection of multiple devices.
- An improved and rapid internet for instant connectivity.

6.0.3 Good User Experience

The user interface of the collaboration tools should provide fast, responsive interface and streamlined browsing experience similar to that of traditional social media tools such as Facebook, Twitter (Hassenzahl 2005) etc. (Jeff Johnson, 2010).

6.0.3.1 Fast

Fastness is a measure of how quickly software can get things done. This depends on both how the software is engineered and the infrastructure that the software is running onto. Advanced techniques such as pre-processing, caching, progressive rendering and various

other optimization techniques can make software work really fast and efficient. Modern web technologies such as HTML5, AJAX, and JSON can make those techniques possible to implement in web based software tools (social media etc.) and other rich internet applications (RIA).

6.0.3.2 Responsive

“Systems that don’t synchronize well with users’ time requirements are less effective tools and they are perceived as unresponsive” (Jeff Johnson 2010, p.151). Based on Miller (1968) and Card et al. (1991), Jakob Nielsen (2013) explains in an article that “the basic advice regarding response times has been about the same for thirty years”:

- “**0.1 second** is about the limit for having the user feel that the system is reacting instantaneously, meaning that no special feedback is necessary except to display the result.
- **1.0 second** is about the limit for the user's flow of thought to stay uninterrupted, even though the user will notice the delay. Normally, no special feedback is necessary during delays of more than 0.1 but less than 1.0 second, but the user does lose the feeling of operating directly on the data.
- **10 seconds** is about the limit for keeping the user's attention focused on the dialogue. For longer delays, users will want to perform other tasks while waiting for the computer to finish, so they should be given feedback indicating when the computer expects to be done. Feedback during the delay is especially important if the response time is likely to be highly variable, since users will then not know what to expect.”
  (Jakob Nielsen , Response Times: The 3 Important Limits, 2013-based on Miller, 1968 pp. 267-277)

A responsive system keeps up with users, keeps them informed about its status, and do not make them wait unexpectedly- which is one of the most important determining factors of user satisfaction (Jeff Johnson, 2010). “Responsive systems keep a user informed even if they cannot fulfill the user’s requests immediately. They provide feedback about what the user has done and what is happening, and they prioritize the feedback based on human perceptual, motor and cognitive deadlines” (Jeff Johnson, 2010, p.152; Duis & Johnson, 1990). Even if the software works fast, it creates bad user experience if it’s not designed for responsiveness. This can be related to many real world

situations for better understanding. Jeff Johnsson gives the following example of such a situation:

> "Even if a watch repairman is very fast at fixing watches, he is unresponsive if you walk into his shop and he ignores you until he finishes working on another watch. He is unresponsive if you hand him your watch and he silently walks away without saying whether he is going to fix it now or go to lunch. Even if he starts working on your watch immediately, he is unresponsive if he doesn't tell you whether fixing it will take five minutes or five hours.
> (Jeff Johnson, 2010, p.152)

"To be perceived by users as responsive, interactive software must follow these guidelines" (Jeff Johnson, 2010, p.160):

- "Acknowledge user actions instantly, even if returning the answer will take time ;
- Preserve users' perception of cause and effect
- Let users know when the software is busy and when it isn't
- Free users to do other things while waiting for a function to finish
- Animate movement smoothly and clearly
- Allow users to abort (cancel) lengthy operations they don't want
- Allow users to judge how much time lengthy operations will take
- Do its best to let users set their own work pace"
  (Jeff Johnson, 2010, p.160)

6.0.4 Integrated File and Document management

Users should be able to easily create, edit and share contents (documents, notes, images, videos etc.) with their peers over the network. They should also be able to do it individually or collectively as applicable. The administrator/creator of content must have freedom to regulate privacy settings (for instance, selecting who to share with, who can

view/edit the file etc.), design the organization of files (naming conventions, categorization etc.).

6.0.5 Notification

Notification is probably the most important element of a responsive system. Notifications enable a form of conversation and keep the users informed about the whole environment and other users who interact within the system. Notifications help reducing errors and support the users by reminding them about the things that requires attention. The online social networking tools contain rich set of notifications spread across the system which can support various group dynamics in online collaborative environment beyond its' basic implication. For example, the user can learn whether other team members have read a post or not, what kind of content/events other team members are interacting with (by 'liking' /commenting/poll etc.) that also helps build a sense of users preferences, activities and so on. It is important to mention these notifications can be controlled and configured as per users' personal preference and group policy.

6.0.6 Integrated instant messenger

Instant messenger that is integrated within the primary communication tools can reduce significant number of window switching and excise as a whole. In addition to that, the integrated instant messenger are lite weight and contains the only features that is mostly used . Some of the most common features include but not limited to, checking online status, for how long and what kind of devices users are using to log in etc.

6.0.7 Social Mechanisms

The tool should support three social mechanisms for communication and collaboration: *Conversation*, *Awareness* and *Coordination* (Egea, 2006). Conversation is how people carry on a discussion in social settings. For instance, people use chat box or comment on status updates to continue conversations in a digital environment such as Yammer, Facebook and twitter. Awareness is about knowing what is happening in the surroundings , for example the 'Ticker' in facebook and the 'Recent activity' section in Yammer Coordination takes place when a group of people act or interact together to achieve something online (see figure 30).

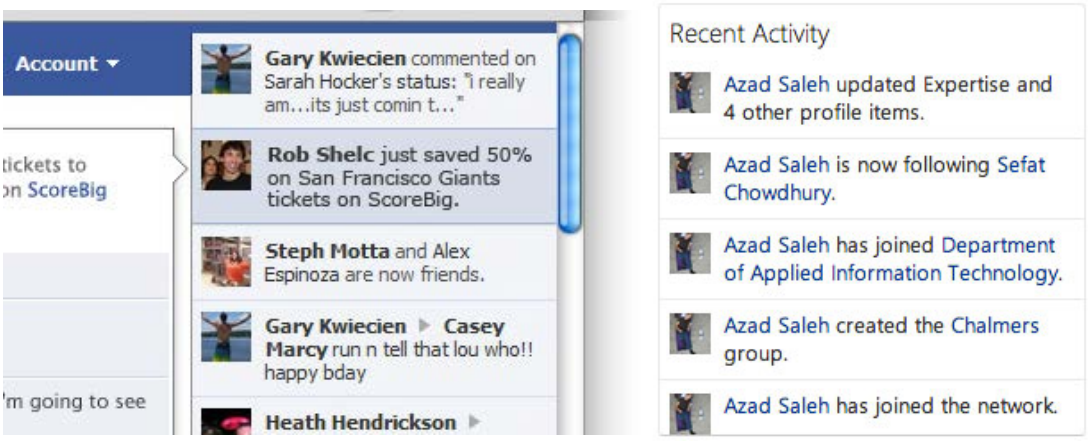


Fig 30 shows the 'Ticker' of Facebook to the left and the 'Recent Activity' section to the right.

6.0.8 All inclusive tool

Finally, this new tool should act as a central point of interaction in online collaboration that could potentially replace Microsoft Outlook for that role. An inclusive tool should eliminate the need of having several different tools and rather combine all functionalities as one unified solution. For example Yammer eliminates the need of having different tools for instant messaging, emailing, file sharing and management etc.

6.1 Comparing various Social networks

We selected various social networking platforms to examine how well the existing features match our elicited requirements. The following figure includes comparison of social networks like Twitter, Facebook, Yammer, LinkedIn and YouTube. Interestingly, Yammer fulfills all the elicited requirements to support online social collaboration as discussed.

✓ Yes

✗ No

○ To some extent

Elicited Requirements	Twitter	Facebook	Yammer	LinkedIn	YouTube
Good User Experience (fast, responsive interface)	✓	✓	✓	○	○
Integrated File and Document management	✗	✗	✓	✗	✗
Notification (seen/unseen, read/unread mark for new content & interactions)	○	✓	✓	○	○
Integrated instant messenger	✗	✓	✓	✗	✗
Social Mechanisms (Conversation, Awareness & Coordination)	○	✓	✓	○	○
All inclusive tool	✗	○	✓	✗	✗

Fig 31 presents the comparison of elicited requirements in various social networking platforms

We anticipate that Yammer has a very high possibility to become the next big online social communication platform being deployed to build trust in virtual teams. Yammer is built on latest web technologies such as Ajax, HTML5, CSS 3 etc., which ensures fast and responsive user interface and superior user experience. The integrated file and document management section is very easy to use and clutter free. In addition to that, users have powerful control over configuring the notification to regulate the traffic flow in their home page. Moreover, a lightweight yet effective Instant Messenger and private group creation capability makes Yammer a powerful all inclusive tool for enterprise virtual team collaboration.

Chapter 7: Discussion

7.0 Introduction

This chapter will review the two research questions defined in the beginning of the thesis based on the overall conducted research and the results presented in the previous chapter.

7.1 Question 1: How can online social collaboration help address problems such as- building trust in virtual teams?

The concept of good teamwork is not a new thing. In fact, in traditional work environment the theory of high trust and great collaboration has been long practiced. By definition, collaboration is a social activity. As the companies move towards online collaboration, the requirements have not really changed much except the need for new technological solution that can facilitate virtual team collaboration. The traditional online collaboration has been designed with a focus on the technology rather than the people. Online social collaboration tools are based on a peer-to-peer model to facilitate knowledge sharing and enable team productivity which is very similar to a real world scenario. Although there are many decision makers out there who are skeptical about the value of social collaboration tools based on the biases concerning consumer faced social networking websites like Facebook and Twitter. It is to be noted that the term 'social' has become more of a 'cliché' because of the tendency to associate the term with fun and time wasting social application such as Facebook, twitter etc. Many decision makers are influenced by this bias and fail to see the underlying value of integrating this kind of social architecture in online collaboration. However, Microsoft recently decided to fold Yammer into the Microsoft's Office Division business unit, indicating that the company sees social networking as the key to the future of its flagship software. The CEO of Yammer David Sacks strengthens this argument by telling Wired (American magazine on technology, economy, politics etc.) that the company is exploring how to integrate Yammer with SharePoint (enterprise collaboration), Office 365 (cloud-based productivity), Skype (video conferencing) and Dynamics (CRM) (PCWorld 2012).

Another reason why this emerging collaboration can add significant value is that– it can facilitate the participation and inclusion of the weak ties (Granovetter, 1973) in online environment, which is not possible by traditional collaboration tools. At the workplaces,

every employee has few strong ties (Granovetter, 1973) and other relationships that are mostly weak ties. These weak ties can work as a bridge when it comes to disseminating information within the organization. Online social collaboration help connecting the remote strong ties but more importantly it can also connect the weak ties that can expose someone to getting access to useful information (for instance, while browsing out of curiosity) that is not possible with traditional collaboration tools such as email or instant messenger. These weak ties can be compared with the acquaintances in our real life. Technology that can support including these happenings within one's eyesight can create team awareness as well as the sense of team belonging. We think this can eventually lead to higher trust amongst team members as they learn more about the daily activities of each other.

7.2 Question 2: Why should user experience of virtual collaboration be aligned to the online social communication experience of people outside of work?

We strongly believe aligning user experience is an important aspect while deciding on enterprise social collaboration tool. One way to understand this is to look at the lifestyle and technology usage of people outside work. Today, people design their lifestyle around these social tools which result in novel user experiences and new user behaviors. Technology changes expectations and once people learn smarter way of doing things, they expect it to be the same everywhere. While there is a huge shift in our online experience and approaches to digital use, we think that it is creating a gap between inside and outside the workplace (as changes take a while in organizational context). If the user experience at the workplace is not decently aligned with that of our everyday life, it can create cognitive imbalance and negative emotions while using it. To strengthen this idea, we came across to a recent research survey conducted by Siemens Enterprise Communications (2013):

> "Mobility is now the norm and users expect the tools they use at work to be as simple and elegant as the technology they use in their personal lives. Enterprises should deploy communication solutions that allow users to effortlessly move among media – voice, text, video and social – all with a consistent, intuitive and 'joyful' user experience."
> (SEC, The Untapped Potential of Virtual Teams, 2013, p.6)

7.3 Future work

In order to extract true value out of online social collaboration, it is important to conduct in detail research on various possible use patterns, tool mechanics and behavioral dynamics of these collaboration tools such as Yammer in virtual team context. To fully understand the use patterns it is crucial to observe the actual use of the collaboration tools (such as Yammer) for an extended period of time. Use patterns might be influenced by factors such as culture, time zones, relationships, age, professions etc. For example, it could be interesting to find out for what purposes people would use Yammer? What age group uses the tools more? How do cultural backgrounds of individuals affect the use of Yammer? What various forms of relationships can take place and how does that affect productivity?

Other interesting research could be to truly understand the power of the tools, which means- what features are available and how could those be utilized most effectively to meet organizational requirements?

The other aspect is to research on the behaviors, the strategies and the attitudes towards the collaboration tools that forms over time.

Based on the findings, the organizations can regulate the usage of these tools to create new organizational culture or adjust the existing culture as required.

Chapter 8: Conclusion

Communication is at the core of creating high trust. It is almost a reality today that sooner or later the global companies are going to embrace online social collaboration. Moreover, as identified by Arvid Carlsson and Nils-Ake Hillarp at the National Heart Institute of Sweden, the dopamine system in our brain motivate us to seek out more information out of curiosity, want, search and desire (Weinschenk, 2011).

The online social networking websites are also criticized for creating browsing addiction, which can be detrimental to organizational productivity. Specially, the newly evolved form of browsing habit where the users 'hang around' on social networking websites as opposed to previous web surfing habits that Jakob Nielsen describes as: "Most people just want to get in, get it and get out" (Hart et al. 2008, p.2). However, this exact nature of working with these tools, keeps the users connected to their peers all the time while working without creating disruption. This also helps building awareness about the surroundings and perceived sense of team belonging within the virtual environment.

As we mentioned earlier, the trending collaboration tools can satisfy the found requirements particularly- Yammer which currently looks very promising. It has almost all latest social features we emphasized on as well as rich user experience designed from human centered perspective. Hence, it is crucial for Volvo IT to take enough time for conveying research in order to design organizational culture based on such social collaboration tools.

References

Annika Valtari (2009). "*Web 2.0 User Experience: Social Media and Ajax Technology*", Faculty of Electronics, Communications and Automation. Helsinki University Of Technology.

Anria Sophia van Zyl (2009). *"The impact of Social Networking 2.0 on organisations"*. Emerald 27.

Bartlett-Bragg, A. (2006). *"Reflections on Pedagogy: Reframing Practice to Foster Informal Learning with Social Software"*.

Brandtzæg, P. B., & Heim, J (2007). *"Initial context, user and social requirements for the Citizen Media applications: Participation and motivations in off- and online communities"*. Citizen Media Project, 2007.

Beldjoudi, S., Seridi, H., & Faron-Zucker, C. (2011). *"Ambiguity in Tagging and the Community Effect in Researching Relevant Resources in Folksonomies"*. In*Proc. of ESWC Workshop User Profile Data on the Social Semantic Web*.

Buchanan, R. (2001). "*Human Dignity and Human Rights: Thoughts on the Principles of Human-Centred Design*". Design Issues, Vol. 17(3), 35-40.

Card, S. K., Robertson, G. G., and Mackinlay, J. D. (1991). *"The information visualizer: An information workspace".Proc. ACM CHI'91 Conf.* (New Orleans, LA, 28 April-2 May), 181-188.

Christian Craft (2012). "*User Experience Innovation: User Centered Design that Works, 2012"*. Publication Date: January 24, 2012, Apress.

Cooper, A., Reimann, R., & Cronin, D. (2007). *"About face 3: The essentials of interaction design"*. Wiley: Indianapolis, IN.

Darwish, A. and Lakhtaria, K, I. (2011). "*The Impact of the New Web 2.0 Technologies in Communication, Development, and Revolutions of Societies*". Journal Of Advances In Information Technology, vol. 2, no. 4, November 2011.

Duarte, D.L. & Snyder, N.T. (1999). "*Mastering virtual teams: Strategies, tools, and techniques that succeed*". San Francisco, CA. Jossey-Bass.

eMarketer (2013) , articles, *Social Networking Reaches Nearly One in Four Around the World*
Available at: http://www.emarketer.com/Article/Social-Networking-Reaches-Nearly-One-Four-Around-World/1009976

Encyclopedia Britannia (2013), global.britannica.com, EBchecked, topic, 1335211, "*Social Network*".
Available at: http://global.britannica.com/EBchecked/topic/1335211/social-network

Forlizzi, Jodi and Battarbee, Katja (2004). "*Understanding Experience in Interactive Systems*". Human-Computer Interaction Institute. Paper 46.

Furst, S. A., Reeves, M., Rosen, B. & Blackburn, R. S. (2004) "*Managing the Life Cycle of Virtual Teams*", The Academy of Management Executive, 18 (2), pp. 6-20

Graham Cormode, G. and Krishnamurthy, B. "*Key differences between Web 1.0 and Web 2.0*" First Monday, Volume 13 Number 6 - 2 June 2008.

Hassenzahl, M. (2003). "*The thing and I: understanding the relationship between user and product*". In M.Blythe, C. Overbeeke, A. F. Monk, & P. C. Wright (Eds.) Funology: From Usability to Enjoyment, Dordrecht: Kluwer Academic Publishers, (2003), 31-42.

Hassenzahl, M. (2005). "*The quality of interactive products: Hedonic needs, emotions and experience*". In C. Ghaoui (Ed.), Encyclopedia of Human Computer Interaction. Idea Group.

Hassenzahl, M. and Tractinsky, N. "*User Experience – a research agenda, Behavior & Information Technology*". 25(2), (2006), 91-97.

Henttonen, K. & Blomqvist, K. (2005). *"Managing distance in a global virtual team: The evolution of trust through technology-mediated relational communication"*.

International Organization for Standardization (2010). *"ISO 9241-210: Ergonomics of human-centred system interaction"* - part 210: Human-centred design for interactive systems. International Organization for Standardization, Geneva, Switzerland.

Jakob Nielsen (2013), Article: *"Response Times: The 3 Important Limits"*. Excerpt from Chapter 5 in Jakob Nielsen (1993), *"Usability Engineering"*. Based on: Miller, R. B. (1968). Response time in man-computer conversational transactions. *Proc. AFIPS Fall Joint Computer Conference* **Vol. 33**, 267-277.

Jarvenpaa, S. L., & Ives, B. (1994). *"The global network organization of the future: Information management opportunities and challenges"*. Journal of Management Information Systems, 10 (4), 25-57.
Jarvenpaa, S. L., & Ives, B. (1999),*"Communication and trust in Global virtual teams"*. Organization Science November/December 1999 10:791-815;

Jeff Johnson (2010), *"Designing with the Mind in Mind: Simple Guide to Understanding User Interface Design Rules"*. Elsevier, First edition, ISBN-10: 012375030X.

Jennefer Hart, Charlene Ridley, Faisal Taher, Corina Sas, Alan Dix (2008), *"Exploring the Facebook Experience:A New Approach to Usability"*. Computing Department

Jetter, H.C. and Gerken, J. (2006). *"A Simplified Model of User Experience for Practical Application"*. First published in: NordiCHI 2006, Oslo.

Jordan, P. W. (2000). *"Designing pleasurable products"*. London: Taylor & Francis.

Jordan, P. W. (2002). *"Designing Pleasurable Products: An Introduction to the New Human Factors"*. CRC Press (2002).

Joseph Giacomin (2012). *"What is Human Centred Design?"*. Human Centred Design Institute, Brunel University, United Kingdom.

Kanawattanachai, P., and Yoo, Y. (2002) "*Dynamic nature of trust in virtual teams*". Sprouts: Working Papers on Information Environments, Systems and Organizations (Vol 2).

Kathy Egea (2006). "*Relationship Building in Virtual Teams: An Academic Case Study*" . Proceedings of the 2006 Informing Science and IT Education Joint Conference, Central Queensland University, Rockhampton, Australia.

Kimble, C., Li,F. & Barlow, A. (2004). *"Effective virtual teams through communities of practice"*.

Kirkman B, L., Benson Rosen, Cristina B. Gibson, Paul E. Tesluk and Simon O. McPherson (2002). *"Five challenges to virtual team success: Lessons from Sabre, Inc."*. August 1, 2002 vol. 16 no. 3 67-79.

Kristof, A. L., K. G. Brown, H. P. Sims, Jr., K. A. Smith. (1995). "*The virtual team: A case study and inductive model.* M. M. Beyerlein, D. A. Johnson, S. T. Beyerlein, eds. Advances in Interdisciplinary Studies of Work Teams: Knowledge Work in Teams, vol. 2. JAI Press. Lancaster University, InfoLab21, Lancaster, England.

Lee, M. J. W., & McLoughlin, C. (2008). "*Harnessing the affordances of Web 2.0 and social software tools: Can we finally make 'student-centered' learning a reality?"* Paper Koçak-Usluel, Y., Mazman, S. G. (2009). *"Adoption of Web 2.0 tools in distance education"*. *International Journal of Human Sciences* [Online]. 6:2.

Linda M. L. Peters (2003). "*The Virtual Environment: The "How-to" of Studying Collaboration and Performance of Geographically Dispersed Teams"*. wetice, pp.137, Twelfth International Workshop on Enabling Technologies: Infrastructure for Collaborative Enterprises.

Lipnack, J., & Stamps, J. (2000). "*Virtual Teams: People Working Across Boundaries with Technology"*. (2nd ed.). New York: Wiley.

Lipnack, J., J. Stamps. (1997). "*Virtual Teams: Reaching Across Space, Time, and Organizations with Technology*". John Wiley and Sons, New York.

Loughran, J. (2004). "*Nurturing global virtual teams*". In S.Reddy (Ed), Virtual teams: Contemporary in- sights (pp. 1-19).

Mark S. Granovetter (1973). "*The strength of weak ties*" . American journal of sociology, Volume 78, Issue 6 (May, 1973), 1360-1380.

McCarthy. J. and Wright, W (2004).*"Technology as Experience, Interactions*". MIT Press, (2004).

Michael Lietdke (25 June 2012). *"Microsoft Buys Yammer For $1.2 Billion". The Huffington Post*. Retrieved 25 June 2013.

Minge, M. (2008). "*Dynamics of User Experience*". Technische Universität Berlin, GRK prometei Franklinstraße 28-29, Sekretariat FR 2-6 D-10587 Berlin.

M. L, Vishwakarma , V. Parashar and J. kumar (2008). *" Social Networking: Information Sharing Tools for academic librarie.* Vol.1,Issue.8/June. 2013 ISSN : 2319-8435.
Murugesan,San. (2007). "*Understanding Web 2.0.".* IT Pro. Vol. , July/August .P. 34-41.

N. Ehsan, E. Mirza, and M. Ahmad (2008). "*Impact of computer-mediated communication on virtual teams performance: An empirical study in Information Technology*". ITSim 2008, International Symposium on, vol. 3, pp. 1–8.

Nasa-(National Aeronautics and Space Administration). Home, Z. ARCHIVES -- LEGACY CONTENT , Cport -- Department of the Navy > "*D. Development Model*".

Norman, D. A. Emotional Design (2004). "*Why we love (or hate) everyday things*", New York: Basic Books, (2004).

Norman, D.A. (1998). "*The Psychology of Everyday Things*". New York: Basic Books.

O'Reilly, T., & Musser, J. (2006). "*Web 2.0 Principles and Best Practices*". O'Reilly Radar.

Patrick Lencioni. (2002). "*The Five Dysfunctions of a Team".* 229 pages, Published April 11th 2002 by Jossey-Bass.

Pauleen, D. (2004). "*Virtual teams: Projects, protocols and processes*". Hershey: PA., Idea Publishing Group.

Paulsen, M. F. (1995a, August 1996). "*The online report on pedagogical techniques for computer-mediated communication*", volume 8, *NKI*.

PCWorld (Aug 7, 2012), Article, 260517, in article: "*What the heck is Yammer?*" Available at: *http://www.pcworld.com/article/260517/what_is_heck_is_yammer.html*

Peters, Isabella (2009). *"Folksonomies. Indexing and Retrieval in Web 2.0."*. Berlin: De Gruyter Saur.

Pettenati, M. C., & Ranieri, M. (2006). "*Informal learning theories and tools to support knowledge management in distributed CoPs*". Paper presented at the Innovative Approaches for Learning and Knowledge Sharing, EC- TEL. Workshop Proceeding, 2006.

Pilgrim,Chris J (2008). "*Improving the Usability of Web 2.0 Applications*". HT'08, Vol. June 19-21, 2008.P. 239-240, ACM.

Preece,J., Rogers, Y., & Sharp, H. (2002). "*Interaction design: Beyond human-computer interaction*". New York: John Wiley & Sons.

Prusak's Trust Model based on: Cohen, D. and Prusak, L. (2001). "*In Good Company*", Harvard Business School Press. P. 4.

Rosen, B., Furst, S. & Blackburn, R. (2007) "*Overcoming Barriersto Knowledge Sharing in Virtual Teams*", Organizational Dynamics, 36 (3), pp. 259-273.

RW3 CultureWizard (2012). "*The Challenges of Working in Virtual Teams*". Virtual teams survey report 2012, 55 Fifth Ave., New York, NY 10003.

Saunders, C.S. (2000). "*Virtual teams: Piecing together the puzzle*". In R.W. Zmud (Ed.) Framing the domain of IT management: Projecting the future through the past, Cincinnati, OH: Pinnaflex.

Siemens Enterprise Communications (2013), Unified Communication. "*The Untapped Potential of Virtual Teams, 2013*". White Paper, Published: October 23 2012.

Simon Wright & Juraj Zdinak (2013), "*New communication behaviors in a Web 2.0 world — Changes, challenges and opportunities in the era of the Information Revolution*". Strategic white paper, Alcatel Lucent.

S Kinsella, A Passant, J, G. Breslin, S Decker A, Jaokar.. (2009), "*The Future of Social Web Sites:Sharing Data and Trusted Applications with Semantics*". Advances in Computers, vol. 76 121 Copyright © 2009 Elsevier Inc. ISSN: 0065-2458/DOI: 10.1016/S0065-2458(09)01004-3

Susan Weinschenk Ph.D. (2011). "*100 Things Every Designer Needs to Know About People*". Publication Date: April 24, 2011, New Riders.

Townsend, A., DeMarie, S., and Hendrickson, A. (1998). "*Virtual Teams:* Trust Model, *Technology and the Workplace of the Future,*". Academy of Management Executive (12:3), pp. 17-29.
Accessible at: *http://wiki.nasa.gov/federal-knowledge-management-working-group-kmwg/wiki/home/z-archives-legacy-content/cport-department-of-the-navy/d-development-model/*

Wu Z.Q., (1996). "*Computer Mediated Communication: From Media Selection to Human Relations*". Proceedings of 1996 Conference of Communication Ecology, Taipei, Taiwan: National Chung Cheng University.

Yammer (2013), About, Yammer.com, Privacy: "*Yammer Privacy Statement*"
Available at: *https://about.yammer.com/privacy/*

Young,G. Oliver (2007). "*Topic Overview: Web 2.0.*" Forrester Research Inc.

Appendixes

Appendix A: Survey Questions

Basic Information

Q1.

Your Age

Q2.

Your Profession

Q3.

How long is your experience with Volvo Information Technology? (e.g. 5 months, 8 years etc.)

Teamplace discussion forum

Q4.

Do you have previous experience of interacting in an online discussion forum?

- Yes
- No

Q5.

Are you aware of that there is a discussion forum in Teamplace?

- Yes, I have experience using it before
- Yes, but did not require using it for anything
- No, I am not aware of it

Measuring Tools Use

Q6.

What percentage of your time do you spend on the following tools for communicating everyday at Volvo IT?

Click on a box and drag left and right <--->

	0 10 20 30 40 50 60 70 80 90 100	
Email		0
Video conference		0
Messenger (lync chat)		0
Audio talk (e.g. voice call, lync, softphone etc.)		0
Team Discussion Forum		0
Others		0
Total:		0

Email Traffic measure

Q7.

How many emails do you generally receive and respond to in a typical working day?

- less than 10
- 11 to 20
- 21 to 30
- 30 to 40
- more than 40

Q8.

What is the minimum/maximum time you spend on an email?

Minimum time	
Maximum time	

Q9.

Please write few lines about the situation(s) when you get to spend minimum time on an email?

Hint: For example, when I don't need to talk to my colleagues and i know what to reply. It just takes a minute.

Q10.

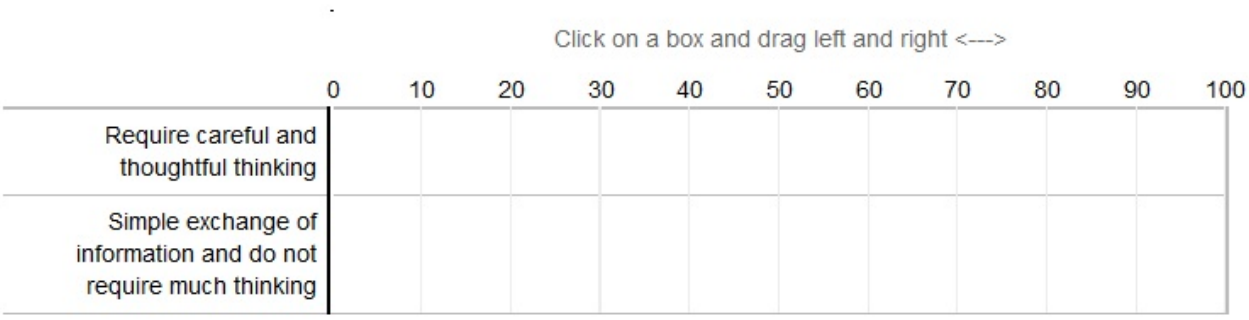
What percentages of the emails have single and multiple recipient(s)?

Click on a box and drag left and right <--->

	0	10	20	30	40	50	60	70	80	90	100	
Single recipient												0
Multiple recipients												0
Total:												0

Q11.

What percentage of the emails you reply to match the following scenarios?



Q12.

How often do you read the entire email conversations or parts of it before responding to the latest one received? (of the same email subject)

- Never
- Occasionally
- Very Often
- Always

Q13.

What do you think about tracking and finding previous email conversations in Microsoft Outlook? (Compare to similar systems for example, Hotmail, Website, Forums you use outside workplace)

- Very Difficult
- Difficult
- Somewhat Difficult
- Somewhat Easy
- Easy
- Very Easy

Q14.

How important is it for you to get email notification?

- Unimportant
- Not So Important
- Important
- Very Important

Q15.

How often do you need to be involved in long discussions/conversations that require careful and well thought out replies?

- Never
- Rarely
- Sometimes
- Often
- All of the Time

Forum feedback

Q16.

For longer conversations what do you think are the pros and cons of email vs discussion forum?

Appendix B: Survey Results

Initial Report

Last Modified: 05/31/2013

1. Your Age

Text Response
52
31
33
36
35
25
36
36
25
40
37
34
39
39
40
46
40
50
47
29
47

Text Response
52
31
33
36
35
25
36
36
25
40
37
34
39
39
40
46
40
50
47
29
47

Text Response
52
31
33

36
35
25
36
36
25
40
37
34
39
39
40
46
40
50
47
29
47

Statistic	Value
Total Responses	21

2. Your Profession

Text Response
Response 1
Response 2
Response 3
Response 4
Response 5
Response 6
Response 7
Response 8
Response 9
Response 10
Response 11
Response 12
Response 14
Response 15
Response 16
Response 17
Response 18
Response 19
Response 20
Response 21

	Value
	21

3. Do you have previous experience of interacting in an online discussion forum?

#	Answer	Bar	Response	%
1	Yes		19	90%
2	No		2	10%
	Total		21	

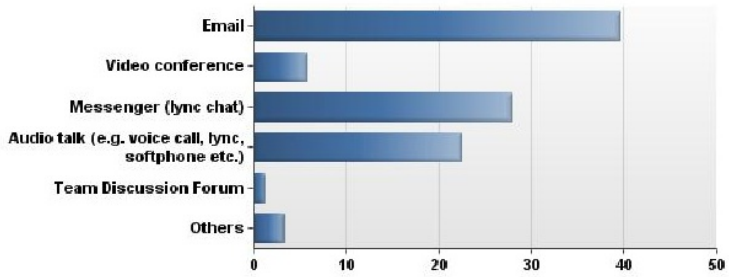
Statistic	Value
Min Value	1
Max Value	2
Mean	1.10
Variance	0.09
Standard Deviation	0.30
Total Responses	21

4. Are you aware of that there is a discussion forum in Teamplace?

#	Answer	Bar	Response	%
1	Yes, I have experience using it before		15	71%
2	Yes, but did not require using it for anything		4	19%
3	No, I am not aware of it		2	10%
	Total		21	

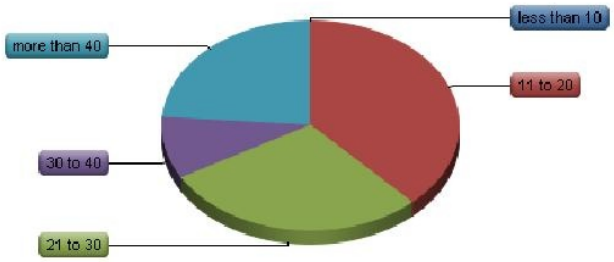
Statistic	Value
Min Value	1
Max Value	3
Mean	1.38
Variance	0.45
Standard Deviation	0.67
Total Responses	21

5. What percentage of your time do you spend on the following tools for communicating everyday at Volvo IT?



#	Answer	Min Value	Max Value	Average Value	Standard Deviation
1	Email	16.00	100.00	39.52	18.94
2	Video conference	0.00	34.00	5.67	7.92
3	Messenger (lync chat)	0.00	55.00	27.81	15.34
4	Audio talk (e.g. voice call, lync, softphone etc.)	0.00	54.00	22.52	14.55
5	Team Discussion Forum	0.00	7.00	1.29	2.17
6	Others	0.00	22.00	3.19	6.66

6. How many emails do you generally receive and respond to in a typical working day?



#	Answer	Bar	Response	%
1	less than 10		0	0%
2	11 to 20		8	38%
3	21 to 30		6	29%
4	30 to 40		2	10%
5	more than 40		5	24%
	Total		21	

Statistic	Value
Min Value	2
Max Value	5
Mean	3.19
Variance	1.46
Standard Deviation	1.21
Total Responses	21

7. How long is your experience with Volvo Information Technology? (e.g. 5 months, 8 years etc.)

Text Response
15 years
4 years
6 years (as a consultant)
8 years
6 ,5 years
4 years
12 years
5 years
1 year and 6 months
7 years
12 year
5+1 year
8 yrs
3 years
15
24 years
2 years
15
1.5 years
3 yrs 11 months
18,5 years

Statistic	Value
Total Responses	21

8. What is the minimum/maximum time you spend on an email?

Minimum time	Maximum time
1 minute	10 minutes
1	5
2 minutes	1,5 hours
5 seconds	30 minutes
less than 1 minute	15 minutes
3 hours	5 hours
30 sec	5 mins
2h	6 h
5 min	30 min
1 s	10 min
1 minute	10 minute
30 sec	more than 2 hours
0:15	1:05:00
0 min	4 hours
60	120
2 minutes	30 minutes
1 min	15 min
1 minutes	15 minutes
10	20
5 Min	15 Mins
10 min	40 min

Statistic	Value
Total Responses	21

9. How often do you read the entire email conversations or parts of it before responding to the latest one received? (of the same email subject)

#	Answer	Bar	Response	%
1	Never		0	0%
2	Occasionally		4	19%
3	Very Often		11	52%
4	Always		6	29%
	Total		21	

Statistic	Value
Min Value	2
Max Value	4
Mean	3.10
Variance	0.49
Standard Deviation	0.70
Total Responses	21

10. What do you think about tracking and finding previous email conversations in Microsoft Outlook? (Compare to similar systems for example, Hotmail, Website, Forums you use outside workplace)

#	Answer	Bar	Response	%
1	Very Difficult		0	0%
2	Difficult		2	10%
3	Somewhat Difficult		3	14%
5	Somewhat Easy		4	19%
6	Easy		7	33%
7	Very Easy		5	24%
	Total		21	

Statistic	Value
Min Value	2
Max Value	7
Mean	5.24
Variance	2.79
Standard Deviation	1.67
Total Responses	21

11. Please write few lines about the situation(s) when you get to spend minimum time on an email? Hint: For example, When I don't need to talk to my colleagues and i know what to reply. It just takes a minute.

Text Response
When I immediately know what to reply
When it´s a known information for me.
When a short answer is needed and I already know what to reply.
It's to reply to a short question
Minimum: fast reply when I know the answer or not, and reply for meeting invitations Maximum: when the answer needs to be business/political correct, when it is important to be correctly understood
When it's I talk to my collegues.
When I know the receiver/sender and so not need to write a lot of explaining text.
When the questions are written in a right way (one item per question) and that it is more a validation than a question it takes me just one minute to answer.
When the question requires a yes/no answer. When I tell a customer I'm done with the task they gave me.
Deleting an e-mail that I know is obsolete/read just by looking at the subject
It's a clear question, I'm the correct receiver, I have the answers by my self
If it's just a confirmation needed from my end.
Emails of the type CC.
If there is only one question in the email and I know the answer. Short emails are often easier to respond to. If a lot of people are involved it takes more time to answer. If I know the person well it takes less time to answer.
The email is a confirmation of an action done. The email is an aknowledgement. The email is to be transfered to someone in my team for action. The email is a newsletter The email is a corporate information
i spend manymum time when i have all information in my side and i don't need some help from my collegues
for emails like: > confirmation > wel known information
Just reply with yes or no to a question
quick answers, how to type questions
Just a reply, in one sentence. Minimal explanation required
When I don't need to check my answer with third parties, I can quicly respond to the mail.

Statistic	Value
Total Responses	21

12. What percentage of the emails have single and multiple recipient(s)?

#	Answer	Min Value	Max Value	Average Value	Standard Deviation
1	Single recipient	17.00	90.00	51.48	20.29
2	Multiple recipients	10.00	83.00	48.52	20.29

13. What percentage of the emails you reply to match the following scenarios?

#	Answer	Min Value	Max Value	Average Value	Standard Deviation
1	Require careful and thoughtful thinking	20.00	89.00	48.67	21.61
2	Simple exchange of information and do not require much thinking	11.00	80.00	51.33	21.61

14. How important is it for you to get email notification?

#	Answer	Bar	Response	%
1	Unimportant		5	24%
2	Not So Important		8	38%
3	Important		7	33%
4	Very Important		1	5%
	Total		21	

Statistic	Value
Min Value	1
Max Value	4
Mean	2.19
Variance	0.76
Standard Deviation	0.87
Total Responses	21

15. How often do you need to be involved in long discussions/conversations that require careful and well thought out replies?

#	Answer	Bar	Response	%
1	Never		0	0%
2	Rarely		3	14%
3	Sometimes		11	52%
4	Often		6	29%
5	All of the Time		1	5%
	Total		21	

Statistic	Value
Min Value	2
Max Value	5
Mean	3.24
Variance	0.59
Standard Deviation	0.77
Total Responses	21

16. For longer conversations what do you think are the pros and cons of email vs discussion forum?

Text Response
Forum is better because the information will be centralized.
In a discussion forum I think it´s easier to get an easy overview of the conversation. In an email it can sometimes be harder to follow a long conversation.
The pros for email is that my working desk is Outlook, that's my base of information. I prefer getting informaiton in email since I'd feel that going elsewhere to look for it would be out of my way, so to say. Discussion forums are great, then you can gather everything that is linked to a certain question and go there for all the answers.
In a discussion forum you should be able to get a better overview of an entire conversation (that is if the discussion forum is good enough). The cons are that we are more familiar in checking our emails on a regular basis, which means that there could be a treshold if people do not go into the discussion forum as regularly.
Discussion forum: Pros: Shared, stored Cons: Need to follow the whole discussion Email: Pros: Can be short, can be divived or merge into a discussion Cons: Only for the people involved in the emails
Email: Pros - I can answer when I have time (compare to Lync where people expect a quick reply) Cons - Too many mails Discusson forum: Pros - Easier to follow conversation threads, easier for multiple people to have their say, an open conversation Cons - No alert of replies (at least not by default in Teamplace - must set up own alert), no indication of what I have read/not read, no ability to mark replies/conversations I find important to me
Pros with disc. Easier to track and get an overview of the conversation, easier to involve several parties in the dialogue (the opposite accounts for e-mails) Cons with disc. Harder to insure that all involved parties notices new postings. Harder to get clear endings/closure of the discussion from all parties.
Discussion forum + Godd overview of the entire conversations. You can be sure to answer to the latest post + You can replay to a post that isn't the latest - You need to browse to another place than outlook Outlook + Familiar tool + Everything is in the same tool
Pros email clear, easy to use, know how it works. cons discussion forms looks old, options threaded/flat not like any PHP forum on internet
If it is in a discussion fora I will not get disturbed, but also, I could forget about the discussion. In a discussion fora it is saved in a better way than in email.
for me email is the best tool for answer and keep historic conversation ; do not need to open word or another microsoft tool
pro email: > well known tool > easier to know who can read the conversation > email tool is well integrated in my daily work pro discussion forum > easier to follow the discussion tree > easier to reuse
everyone uses emails...discussion forums are not widely used or known about.

Statistic	Value
Total Responses	13