

IMPLEMENTING UNIFIED COMMUNICATION

FROM THE PERSPECTIVE OF END-USERS
- A CASE STUDY IN STATOIL

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This Master's Thesis is carried out as a part of the education at the University of Agder and is therefore approved as a part of this education. However, this does not imply that the University answers for the methods that are used or the conclusions that are drawn.

Preface

This thesis presents the research conducted in the final part of the master programme of Information Systems at the University of Agder in Kristiansand, Norway.

The aim of the research has been to explore how the implementation of Unified Communication has been received by employees at Statoil, a major energy company, looking especially at the part of the Unified Communication solution handled by Microsoft Office Communicator.

I would like to thank Ole-Kristian Olufsen who has been my contact person at Statoil, also project manager Arti Haria and the other current and past members of the Unified Communication project team who provided an insight into all the work that had to be done and choices to be made before the users could get their hands on a working product. Of course, a project on how users perceive a new system could not have been done properly without users willing to be interviewed, so a big thanks also to these.

Thanks also to associate professor Eli Hustad, my supervisor, for her guidance and supervision throughout the project, as well as giving me the opportunity to carry out this project in the first place.

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Abstract

The number of communication technologies in use have increased dramatically following the advent of modern information technology, requiring users to learn how to use ever more devices and systems and to choose the appropriate solution for every communication need. This adds complexity to communication and by extension also to getting work done in general.

Unified Communication attempts to make communication and work easier by reducing the number of devices and systems without necessarily reducing the number of technologies/channels available to the users. The purpose of Unified Communication is thus to gather as many channels as possible into one system, then serving this collection out to as many devices as possible in order to let the user choose the device most appropriate for any situation. Unified Communication is a subset of Computer-Supported Cooperative Work, from where the various types of communication involved in a Unified Communication system are drawn.

As the products that enable Unified Communication are rather new, there is not much prior research on how it is implemented in organizations. Research on Unified Communication is mostly limited to proof of concept-type articles and theoretical studies on possible effects. Literature on implementation exists, but in the form of commercial white papers. Benefits from having Unified Communication include, but are not limited to: Cost savings through reducing travel and telephony, employees can more easily work from home, reduced environmental impact, single number reachability and improved information security.

To identify realized benefits to employees a study has been carried out at Statoil, a major energy company headquartered in Norway, following the implementation of a Unified Communication system from Microsoft centred around the products Office Communicator, Live Meeting and Exchange Server. In all, fifteen informants were used, in two main categories: Employees that use this system have been interviewed to identify how Unified Communication has affected their work, also members of the project team that handled the implementation have been interviewed to gain background information on the choices that went into building the system as used at Statoil.

The findings suggest that Unified Communication as handled through Office Communicator is a success, albeit not an unqualified one. Users generally find the system easy to use and superior in quality to older, separate devices and systems for telephony, instant messaging and videoconferencing. However, not all users have learned all of the core functionality they are required to learn if they are to transition from legacy systems to Unified Communication without losing valuable functionality. Training courses have been offered, but have seen little attendance, leading to a noticeable portion of employees being below the skill level where they can comfortably handle calls or messages in all the channels offered by Communicator. Despite this, none expressed a negative attitude toward Communicator, generally praising it as a valuable tool and well worth the effort required to learn its use.

Additionally, Communicator had expanded on existing flexibility in terms of when and where to work, allowing key personnel in one location or time zone to easily adapt their working hours to fit tasks being carried out in other locations/time zones and reducing the amount of travel required.

This has the added benefit of giving employees more time with family and friends without reducing the amount and quality of work these employees are able to do for Statoil.

The use and value of some communication channels such as telephony and videoconferencing was restricted by factors external to the products involved, such as office layouts that were unfavorable for sound-based communication or privacy concerns, also certain task-specific requirements such as regulations requiring traceability of communications and decisions.

If suggestions are to be made, the primary issue that stands out is training and communication. The value of Unified Communication and the products chosen depend on users having the required skills for using the most appropriate type of communication for any context, and that each user can assume that any colleague is able to handle any type of communication. This was handled at Statoil during the second, international round of implementation, where class was made mandatory, but this requirement has not been applied retrospectively to the users in Norway that got Unified Communication in the first round of implementation. Additionally, users were generally not aware why Unified Communication was being implemented and how this was related to older systems being removed, nor did they have a clear impression of where and how they could get help.

This paper expands on the limited research on actual implementations of Unified Communication-systems and can hopefully inspire research specifically on how training affects efficiency of use as well as provide data for comparison of Unified Communication-suites from other suppliers and in other environments.

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1. Introduction

1.1 Background

The number of technologies, systems and products in use for communication between people in a work setting keeps increasing (Bilinski, 2004). Instead of this growth providing ever-increasing efficiency in communication as one gains access to a product or system for every conceivable situation, the result is frequently inefficiency through added complexity when users must manage a large selection of possible communication media (Boettner et al, 2009), not just use the media they have available.

One way of handling this complexity and avoiding the associated inefficiency is by unifying the various systems into fewer devices, ideally providing the user with just a single device without removing his access to any legacy communications system (Lei and Ranganathan, 2004). This is known as Unified Communication, the topic of this thesis.

Ideally, Unified Communication not only reduces the number of devices and applications any user must relate to, but can also result in a number of other benefits. Companies cut costs as they no longer have to maintain a separate network for voice communication or pay a telephone company to send traffic through theirs (Hassan et al, 2000). Additional cost savings are available through reductions in travel or even office space requirements as workers are enabled to work more efficiently from home. Users are given more flexibility in how to get their work done when they are no longer tied to specific locations to get access to colleagues and communications.

Implementing Unified Communication is not without its pitfalls. The weakest link is the user (Bradley and Shah, 2010), who must learn the device(s) or system(s) used to aggregate communications to a single stream and how this can be used to work with greater efficiency than before. Having a system for Unified Communication is not free, and if the implementation fails to create gains greater than the cost, the net result is negative. Therefore it is important that the users gain the skills required to use Unified Communication effectively.

Statoil is an energy company with operations across the world, necessitating effective communications between the various locations. A number of communication technologies are in use, with varying characteristics and degrees of media richness. In an attempt to streamline communication throughout the company, Statoil has embarked on a project to implement a Unified Communication system created by Microsoft. A pilot project has been completed and they are currently deploying a complete system across the world, with customizations according to local regulations, technical limitations and cost.

1.2 Research Questions

This thesis looks at how the employees respond to the new communications paradigm, which benefits and problems they experience and how the new systems influence the way the employees do their job. This is compared to the benefits and changes Statoil set out to achieve as well as those marketed by Microsoft as well as the chosen delivery partner Atea. This thesis revolves around the product Microsoft Office Communicator, adjoining systems will only be covered in how they relate to Communicator.

Based on this, the following research questions have been formulated:

- Which factors are involved in determining which type of communication to use?
- What is required to make Communicator a preferred and effective communication tool?

1.3 Thesis Overview

This thesis is divided into eight chapters:

1. Introduction – Provides the background, the research questions and this outline
2. Company and Project – A brief description of Statoil, their current IT-situation and what they seek to achieve by implementing Unified Communication.
3. Technology – An in-depth description of communication systems in use at Statoil, both those that will see continued use and those that are being retired as a result of this project.
4. Concepts – An in-depth description of the theoretical concepts underlying this project, Unified Communication and Computer-Supported Cooperative Work, as described by researchers as well as how it is presented by vendors.
5. Research Method – How the research was carried out and what sources of information were used.
6. Findings – Here the results/findings of the research is presented.
7. Discussion and Recommendations for Statoil - Comparing the findings of the research at Statoil with prior research and marketing. Using this as a foundation for recommendations as to how Statoil can improve.

2 Company and Project

2.1 Statoil

2.1.1 History and Overview

Founded in 1972 and initially wholly owned by the Norwegian state, Statoil has grown to be the largest operator on the Norwegian continental shelf as well as a major operator in Asia, Africa, the Americas and Russia, with the Norwegian state retaining a 67 % ownership following its transition to a publicly listed company in 2001. In 2007 Statoil merged with the Oil & Gas-division of Norsk Hydro, forming StatoilHydro, the united company was then renamed back to Statoil in 2009.

Following the partial divestment of service stations and their employees into the separate company Statoil Fuel & Retail, Statoil proper today has approximately 20,000 employees. Corporate headquarters are located in Stavanger, other major offices in Norway include Oslo and Bergen. (Statoil, 2010)

2.1.2 Technological Platform

Statoil today has a very heterogeneous computer environment, with 60 % hardware at end of life as well as multiple versions of Windows, Office and other applications deployed to end users. This creates problems for security, reliability, compatibility and collaboration. Supporting a multitude of system configurations is also expensive in terms of pure monetary cost as well as manpower compared to having all users use the same version of any given software.

Technology is seen as a barrier to gaining advantages from global collaboration, especially the lack of compatibility between new and old systems that are not merely different versions of the same product, but instead completely separate products with no common data format.

In addition, the global spread of Statoil means not all systems can or should be used everywhere, for legal, technical and cultural reasons. Local phone networks appear superficially the same across the world to end users, yet their technical foundations and the rules regarding their use vary. Technology, both software and hardware, may be under export restrictions. For Statoil this is especially relevant for their operations in Iran, where the USA places severe restrictions on what of their technology can be deployed locally. Bandwidth may be a scarce resource, typically in developing countries as well as on exploration rigs dependent on satellite communications, putting limitations on which systems can be made to work.

A number of communication types are in use at Statoil and will continue to be used after Unified Communication is implemented, but the device/system used to perform the communication may change:

- Video calls/conferences
- Telephone calls/conferences

- Instant messaging
- Desktop sharing
- Presence information

Statoil has found videoconferencing to be a very valuable tool, clearly superior to audioconferencing and often preferable to travel. In 2008 and 2009 alone the use of videoconferencing increased tenfold, and the main bottleneck to a continued increase of videoconferencing and thus a reduction of inferior or more expensive types of communication is the limited number of rooms and devices for videoconferencing via the Tandberg system.

2.1.3 Goals of the Unified Communication Project

A large number of goals have been presented for the implementation of Unified Communication at Statoil. Some have simple definitions and their level of success can easily be measured, for example *«Encrypted desktop sharing, telephony and video calls»*, where the inability to make an encrypted connection for any of the functions will constitute less than full success. Other goals have less clear definitions and will be hard to measure, such as *«Statoil enterprise business collaboration processes has (sic) been strengthened»*.

Other goals of note include:

- Single number reachability
- Reduced telephony cost
- Reduced travel cost
- Video conferencing at the desktop, integrated with existing Statoil conferencing systems and supporting MS UC federation
- Presence information based on calendar information and call status
- Clarified HSE requirements for use in open landscape

Additionally, Statoil today has rather flexible working hours in Norway, while other office locations usually have more rigid hours. The Unified Communication project may result in even more flexible hours for employees working in Norway in order to increase their availability to colleagues working abroad, this would help Statoil realize benefits from global collaboration.

As a consequence of the global scale of Statoil's operations the project is not tasked with providing 100 % of services and accomplishing 100 % of goals at 100 % of locations. The current goal is what Statoil calls an 80 % solution, where a large majority of goals should be reached in the majority of locations, yet management accepts that some locations will miss out on some or many of the benefits the project sought to deliver. Two examples of this is that single number reachability will not be possible for all locations, also encrypted telephony is not possible from off-the-shelf cell phones.

3 Technology

3.1 Current Systems

3.1.1 Microsoft Office Communicator 2007 R2

Microsoft Office Communicator 2007 R2, hereafter known as MOC, is the core application of this thesis. It provides instant messaging (text), file transfer, audio and video calls, desktop sharing, presence information and close integration with a number of Microsoft products; Office Live Meeting, Office Outlook and Exchange Server. While the full functionality is only available between users belonging to the same Exchange domain, MOC also offers limited functionality to communicate with MOC users connected to other Exchange domains or any client application that can connect to the freely accessible .NET Messenger Service, such as Windows Messenger, Live Messenger and aMSN. Video calls are also possible between MOC and the Tandberg systems used for meeting rooms.

Also noteworthy is the integration between MOC and the local telephone network. For Statoil in Norway this integration means that for users of Statoil-controlled cell phones the cell phone and MOC can be paired. Similar integrations are planned for locations outside Norway, but will vary with the different local phone systems in use. As implemented in Norway, incoming calls ring on both the cell phone and the MOC interface, with the actual conversation being taken on the device of the users choice. Ongoing conversations may be transferred from MOC to cell phone, but not from cell phone to MOC.

According to Munkvold (2003) MOC is an integrated product, while most functionality is drawn from the communication technology category it also offers shared information space technology from the data conferencing subcategory by providing desktop sharing, as well as coordination technology through offering an interface for accessing the calendar and scheduling functions of Outlook.

MOC and the MOC Server have recently been re-branded as Microsoft Lync and Lync Server respectively, though these newer versions are as of writing not deployed at Statoil.

3.1.2 Microsoft Office Live Meeting

From a description of Live Meeting by Microsoft (2010):

With the Live Meeting service, people in an organization can participate in online meetings, events, and training, so that they can easily connect and collaborate with customers, partners, and each other. ... Because Live Meeting sessions can be recorded and played back, those who are not able to attend a Live Meeting presentation can view it later. (p. 8)

Live Meeting is integrated with MOC/Outlook so that the LM application is normally not launched separately from the Start menu, but instead appears as a function inside MOC/Outlook. Live Meeting is a step up from MOC in terms of functionality and number of participants accommodated, yet retains enough similarity that the skill set required for use is nearly identical.

3.1.3 Microsoft Outlook 2003/2007/2010

Outlook is a personal information manager, offering E-mail, calendar/scheduler, smart phone synchronization, contact manager and a number of other features. 2003 is deployed on most older systems running Windows XP, 2010 is the version deployed on the newest systems running Windows 7. Statoil had planned to go directly from 2003 to 2010 as the latter became available, avoiding 2007 to reduce the diversity of applications that had to be supported, but some users needing new functionality not offered by 2003 forced limited deployment of 2007 as a temporary measure. Remaining installations of 2003 and 2007 as well as Windows XP are to be retired soon as part of a larger effort to modernize and homogenize all aspects of basic computing tools at Statoil.

Due to the diverse functionality of Outlook this is also an integrated product according to Munkvolds taxonomy, as it offers both communication technology in the shape of E-mail as well as coordination technology through its shared calendar/scheduler.

3.1.4 Microsoft Servers: Office Communication, Sharepoint and Exchange

These form the hub of the Microsoft-based collaboration technologies available in Statoil. Exchange handles E-mail and calendar/scheduling exchanges, Office Communication handles the communication between MOC clients, as well as transparently handling connections to the external .NET Messenger Service, Tandberg systems and local phone networks. Finally, Sharepoint is the platform for intranet web sites including the team sites used for sharing files and editing Microsoft Office documents directly in the web browser. In Munkvolds taxonomy, team sites are an example of a shared information space technology, offering both content management as well as being an example of web-based team/project rooms through enabling editing to happen directly in the browser instead of the traditional method of download-edit locally-upload.

3.1.5 Tandberg

Tandberg is a formerly Norwegian company now owned by Cisco that produces videoconferencing systems. Statoil has a large number of Tandberg installations in meeting rooms around the world, onshore and offshore. Tandberg systems as installed in meeting rooms provide very good clarity of sound and video and are well suited for group use, but comes with a price tag orders of magnitude greater than that of outfitting ordinary desktop computers with MOC. Another downside is the conflict of interest that arises from having the Tandberg units in meeting rooms. A single person occupying the meeting room for its Tandberg system makes the room temporarily unavailable for offline group meetings, and vice versa. Rarely are the rooms put to their idealized use, hosting group video conferences.

Statoil also have what they call «micro-terminals» from Tandberg. These are small, mobile units for individual use that can be deployed to any office instead of being installed permanently to a meeting room. In functionality they are thus more similar to a regular laptop computer equipped with a webcam and running Office Communicator or Live Meeting than they are to the bigger Tandberg systems, but these «micro-terminals» are still significantly more expensive than the equivalent laptop computer.

3.2 Older Systems

3.2.1 Windows Messenger

Included by default with every installation of Windows XP, Windows Messenger is widely available throughout the Statoil organization. While lacking several of the consumer-oriented features of MSN/Live Messenger such as winks, nudges and custom emoticons, Windows Messenger has some business-oriented features lacking from MSN/Live Messenger: encrypted text transfer between clients, ability to connect to MOC Servers in addition to the .NET Messenger Service and integration with other MS business products such as Sharepoint.

Windows Messenger is the immediate predecessor of MOC, development halted in 2008, but very little had been done to Windows Messenger since 2005, when the first version of MOC was released. Windows Vista and 7 does not support Windows Messenger, so the current users of Windows Messenger at Statoil will lose access as their current XP workstations are replaced/upgraded to run 7.

The main functions of Windows Messenger are instant messaging, file transfer and audio/video calls. In addition it provides an interface for using Microsoft NetMeeting for desktop/application sharing.

3.2.2 Microsoft NetMeeting

Somewhat similar in functionality to Live Meeting, NetMeeting harks back all the way to Windows 95 and Internet Explorer 3. A popular tool at Statoil, its forced retirement initially sparked protests, but these have mostly subsided following adoption of Live Meeting. As with Windows Messenger, NetMeeting is not supported in Windows 7 and is thus automatically lost as XP workstations are replaced/upgraded.

NetMeeting sessions are initiated either by directly dialing the IP-address of the opposite party or by using an *Internet Location Server*, a server that expands and simplifies the NetMeeting service by keeping track of clients even when they are hidden in private networks or their IP address changes.

4 Concepts

4.1 Unified Communication

4.1.1 As Perceived by Statoil

Statoil defines Unified Communication as *«Integration of real-time and non real-time communication services. Real-time services are instant messaging, desktop sharing, telephony and video conferencing. Non real-time services are voice mail, mail and calendar.»*

Statoil expects Unified Communication to provide the following benefits:

- Increased video conferencing capacity
- Simplified and flexible user experience
- Reduced operational costs
- Increased business continuity
- Increased information security

4.1.2 As Marketed by Microsoft and Atea

Statoil is a long time customer of Microsoft and has chosen the Nordic IT-company Atea to supply them with a Microsoft-based solution for Unified Communication.

Microsoft (2011) introduces Unified Communication with *«Unified Communications provides a seamless flow between the work users do and the people they need to connect with to get that work done —leading to a significant increase in overall productivity.»* as well as a video case study with heavy emphasis on cost reduction as well as some on saving the environment.

Atea (2011) has their own marketing material containing a more diverse set of arguments for implementing Unified Communication. The first argument is that employees today want to have freedom and flexibility to work where they want, how they want, and that Unified Communication enables them to do so. Other arguments given include:

- Working from home reduces time wasted traveling, increasing time with friends and family
- Easier access to colleagues
- Reduced travel costs
- Reduced cost for office space and -heating
- Better for the environment

4.1.3 As Defined in Literature

Unified Communication as implemented by Statoil is a recent invention and thus the research literature is still somewhat limited. Boettner et al (2009) give the following introduction to the concept and its possible negative impact on users:

Unified communication, an amalgamation that includes video, voice and data, provides opportunities for customized communication. This unified communication can paradoxically lead to inefficiencies for the user as the communication may become more complex. Additional complexity is introduced when the users have to manage each new method of communication between parties. (p. 1)

Lei and Ranganathan (2004) go into more technical detail, yet leave out possible negative effects:

Modern man is part of a highly connected communication network. People can interact with each other through a wide variety of communication mechanisms, such as email, instant messaging, cellular phone, landline phone, SMS, voice-mail, and pager. Each means of communication has its own sets of features and drawbacks. Although a person typically has multiple communication devices, he may have access to only a subset of them at a particular time. Depending on his situation, he may also have a preference on which of the available devices to use. ... Hence, a unified communication system that allows a person to communicate using the most convenient device at the time will enhance user experience and offer more opportunities for collaboration. (p. 2)

Hassan et al (2000) explore the cost advantages of modern data networks over traditional phone systems:

Because IP telephony can be supported by data communication networks, multisite enterprises can consolidate their existing telephone networks with data communications networks to achieve large-scale cost savings. The cost saving comes from the fact that enterprises now need maintain only one network to support voice, data, and fax. Since IP telephony also supports video communications, further network consolidation is possible by combining the video network (if the enterprise has a video network for conducting videoconferencing among different sites) into the same network. (p. 2)

They then go on to explain how packet-switched networks can offer both superior sound quality as well as single-number reachability.

Giving users more options for contacting others adds complexity, and complexity can hinder rather than improve communication as the number of options the users must consciously choose from increase (Boettner et al, 2009). Thus, perhaps more important than how many modes of communication a Unified Communication system supports is how easy and natural it is to use, as users should not be forced into «unnatural» interaction with their communication. The system must be built around a user-centric, not a technology-centric, platform. By user-centric is meant that the system should be configured to match the needs of the user in his or her domain (ibid.), hiding/removing functionality that is unwanted or irrelevant and automating common behavior to suit the user's needs. Users should be using, not managing, their communications.

Bradley and Shah (2010) extend on user-centricism by identifying the user as the weakest link.

The weakest link in just about any process is the user. Unified communications and presence can help users to operate more efficiently, but they have to understand the tools available to them and apply them effectively to realize those benefits. Business won't be more efficient and processes won't be more streamlined if an organization invests in unified communications but the end user executes it poorly. Unified communications is more than just a tool; it's a culture. Users need to be provided with training and guidance to enable them to make the shift from their traditional methods of communication, understand presence and how to apply it, and embrace unified communications. (p. 243)

Statoil ran a pilot project with Office Communicator on a limited selection of users, this was followed by Larsen (2010). One observation by Larsen was that users preferred learning the system themselves instead of going to a mandatory classroom course. Users stated that they would prefer voluntary classroom courses, e-learning or quick start-handouts over mandatory classroom courses. They were however aware that learning purely through using the system could lead to important functions going undiscovered. In addition, it appears valuable to get any training or other information early in the process, as habits, including bad ones, develop quickly when self-learning and may obstruct optimal use of a new system.

Statoil is a member of an organization called the Collaboration Consortium, which publishes a journal of experiences and recommendations for electronic collaboration. On the topic of training and adoption the Collaboration Consortium (2009) make no absolute recommendations except to advise companies to cater to the varied preferences of their employees: «*Training can be as formal or informal as an organization cares to invest, but should utilize many mediums to provide employees with choices based on their learning preferences.*» (p. 25)

4.2 Computer-Supported Cooperative Work

Unified Communication is a sub-field of Computer-Supported Cooperative Work – CSCW.

4.2.1 Social Awareness

Within CSCW, maintaining social awareness is vital for working efficiently and effectively, as described by Bardram and Hansen (2010):

Studies of co-located cooperative work show that people tacitly and unobtrusively align and integrate their activities in a seamless and highly sophisticated manner without interrupting each other. ... Social awareness thus helps to minimize interruptions and disturbances when one is engaged in cooperative work. (p. 105)

While social awareness can be maintained easily when working at the same place and time, assistance from some sort of technology is required when either condition changes.

Organizations typically achieve a degree of social awareness by posting the details of who and where on a whiteboard readable by everyone physically present at the department, while communicating the same type of information to users at various locations typically involve computer-based «presence» or «online status» systems (ibid.). This awareness allows for

«appropriate obtrusiveness» (Schmidt, 2002), where those who wish to transmit information or pose a question can see when that is appropriate, and perhaps more importantly, when doing so would be overly disruptive to the receiver. In order to provide the information required for appropriate obtrusiveness, presence information must go beyond merely whether contacts are online or offline, instead displaying what activity the contact is engaged in. Examples of an activity-linked status can include «in a call» and «in a meeting», even linking the Unified Communication system to the calendar system in order to automatically change the status according to the appointments and events stored in the calendar (Bradley & Shah, 2010).

Ackerman (2000) extends on the topic of social awareness, noting the amount of research looking at work processes in shared spaces such as air traffic control centers and trading floors, where workers monitor their colleagues to anticipate their own future work flow. Ackerman differentiates between «regular» awareness, knowing who is present, and peripheral awareness, possessing low-level knowledge of the activities others engage in. This creates a trade-off between awareness and privacy, as well as between awareness and disturbing others.

4.2.2 Content Sharing and Media Preferences

CSCW can enable coworkers not only to communicate about their work, but also to share the actual data they work on in new ways. Bayerl and Lauche (2010) studied the communication between offshore and onshore technical personnel in an oil company. Prior to the implementation of videoconferencing systems much data was sent in the form of spreadsheets, drawings and photos attached to e-mails. This meant data was not transmitted real-time, but instead would always be old, to a varying degree, by the time it was received. The aging of data may have varying importance depending on the content and context of data, and while some data remains valuable over time, other data is may become worthless or nearly so at the instant newer data arrives. E-mail attachments (and e-mails themselves) are of a somewhat permanent nature and poorly suited for communicating data of a «live» nature.

The oil company in the study implemented a videoconferencing system that not only allowed people to see each other when talking, but also to share desktops and data from instruments so all participants in a conversation would have access to the same information. The videoconferencing system was greeted with some hostility in the beginning, with some going so far as placing objects in front of the camera to avoid being watched and others seeing no need for real-time data.

Eventually most employees warmed to the concept and it was found that videoconferencing reduced the number of misunderstandings by ensuring that all participants were looking at the same data, also social bonds that had never been present with the older technologies (telephone, e-mail) developed, going so far as to use videoconferencing for conversations that were purely social. Not all employees were convinced though, some would only use the videoconferencing systems for scheduled conferences, losing the benefits of real-time data analysis by onshore personnel, the social bonding and the reduced rate of misunderstandings.

Not always would the new systems be used to their full potential, onshore personnel would on occasion still request offshore personnel to read out data from their instruments, data that was

already shared through the videoconferencing systems. This behavior was especially prevalent with those employees that disliked the videoconferencing system and kept it disabled during their shift. These employees had a second motive in addition to their stated dislike of the camera. They would send their requests as e-mail, not by other non-video media such as telephone. E-mails were then kept on record to show that they had done what they were supposed to, as a sort of insurance in case their superiors accused them of misconduct or negligence. Fear of punishment from above thus prevented optimum operational efficiency at the lower level.

Offshore personnel also had a habit of ignoring incoming e-mails, leading those seeking them to prefer telephoning their central control room where they knew someone would be able to get them the information or person they desired.

4.2.3 Communication Characteristics

Clark and Brennan (1991) describe eight characteristics of communication:

1. Copresence – group members occupy the same location
2. Visibility – group members can see each other
3. Audibility – group members can hear each other
4. Cotemporality – messages are received approximately when they are sent
5. Simultaneity – group members can transmit and receive simultaneously
6. Sequentiality – group members speaking in turns stay in sequence
7. Revisability – messages can be revised before transmission
8. Reviewability – messages do not fade over time

This expands on the traditional CSCW matrix by Johansen (1988) in which communication is classified into two dimensions, varying only by copresence (same place/different place) and cotemporality (same time/different time).

The various means of communication in use at Statoil can be classified according to Clark and Brennan's criteria:

Table 1: Communication media at Statoil according to Clark and Brennan

	Copresence	Visibility	Audibility	Cotemporality	Simultaneity	Sequentiality	Revisability	Reviewability
Office Communicator - text				x		x	x	
Office Communicator – audio/video		o	x	x	x	x		
Live Meeting – audio/video		o	x	x	x	x		o
Tandberg – audio/video	o	x	x	x	x	x		o
E-mail							x	x
Telephone			x	x	x	x		
Face to face meetings	x	x	x	x	x	x		
Traditional mail							x	x

x = present, o = optional

We see that none of the new communication products offer reviewability by default, nor is it even optional in Communicator, the flagship product of one-to-one communication in Statoil. This is however intentional in the case of Communicator, as Statoil has chosen to disable the text recording available in the product.

Ackerman (2000) supports the need for a fine-grained description of communication:

Social activity is fluid and nuanced, and this makes systems technically difficult to construct properly and often awkward to use. A considerable range of social inquiry has established that the details of interaction matter, and that people handle this detail with considerable agility. ... People's emphases on what details to consider or to act upon differ accordingly to the situation. Yet, systems often have considerable problems handling this detail and flexibility. (p. 3)

When classifying according to the simple CSCW matrix and not by Clark and Brennan's eight characteristics, telephony appears identical to Office Communicator, both for text and video, also E-mail appears identical to traditional mail, which although not directly erroneous obviously falls short when it comes to explaining why companies and people have been so eagerly embracing the newer technologies.

5 Research method

5.1 Strategy, Scope and Schedule

The research subject of this thesis was the implementation of a single set of closely integrated technologies in a single organization, thus this is clearly a single-case study. While a multiple-case study would have provided opportunities for comparing implementation efforts across a more diverse set of organizational cultures it would have required either more man-hours, ie. participation of another student, or a reduction in the depth of the study.

The selection of Statoil as the organization to be studied is a result of Statoil and UiA having a history of collaborating on information systems research and when I was to start my thesis Statoil presented the Unified Communication project to UiA.

This project lasted nearly one year from Statoil pitching the project suggestion to UiA to the final delivery of the thesis, but by far most of the project was done in the last five months, from January through May 2011. In June through December 2010 other commitments severely limited the work on the project to attending some meetings with Statoil personnel involved with implementation of the Unified Communication project as well as planning how to run the rest of the project.

5.2 Methodological Approach

Qualitative method was the natural choice when investigating a relatively unknown concept where relevant quantitative measurements would be difficult to identify. As the purpose of this project was primarily to look at how employees use and feel about a new system it was appropriate to use qualitative method, as it allows informants to explain in-depth about the topics they feel are the most important.

In the early stages I considered following up with a quantitative survey about some of the topics that came up in interviews in order to determine both their relative importance and to what extent informants agreed with each other. This was however decided against as the time required to create, perform and evaluate the survey would be better spent on improving and extending the qualitative part of the data collection.

5.2.1 Interviews of end-users

The initial list of end-users to be interviewed was provided by Statoil, as they have an existing framework for handling research on employees. This list was to provide a diverse selection of informants, with stratification across age groups, departments, educational backgrounds, professional experience and gender (Creswell, 2009). Unfortunately the list was of limited use as some potential informants were no longer with Statoil, others did not respond and some responded that they would be unable to attend. With end-users from the list constituting less than half the end-users eventually interviewed, the intended stratification cannot be assumed to exist.

In order to provide a satisfying number of informants within a short time I sidestepped the Statoil research framework along with my project facilitator and improvised a less scientifically rigorous method of recruiting. Instead of a random sample we got a convenience sample (ibid.). I contacted prior acquaintances I knew to be working at Statoil while the project facilitator contacted fellow IT-professionals around the company requesting them to ask for volunteers at their department and/or location, with a preference for non-IT personnel. Asking for volunteers to be interviewed about an IT system may have skewed the selection toward a higher level of IT-competence than is representative for the Statoil average, as those who are uncomfortable with computers and have limited IT skills may be less likely to volunteer.

In total we got 9 informants, their age ranging from 26 to 49, with 2 to 13 years experience working for Statoil or companies that have been purchased by Statoil. They were located in three Norwegian cities (Stavanger, Bergen and Oslo) and four American countries (Canada, USA, Venezuela and Brazil). A majority had graduate or postgraduate qualifications in engineering or geoscience, among the remainder there were varying levels of education in information management and IT. Notably absent from the group of informants despite their substantial numbers at Statoil were employees with background in social sciences such as business administration, law, human resources and sociology, as well as those with technical (non-IT) qualifications from secondary school. Also notably absent were employees from offices in Europe (non-Norway) and Asia.

The interviews of end-users were carried out in a semi-structured fashion. The informants received an e-mail informing what the research project was about and that they unless they requested to be taken off my list would soon be contacted via Microsoft Office Communicator to schedule the interview. In most cases the interview was then conducted as a recorded video conference via Microsoft Office Live Meeting, though Tandberg video conference and Communicator telephony had to be used to reach three informants at smaller offices. The interviews were started with me introducing the project in some more detail than what was provided in the e-mail and answering any questions the informants had about the project itself, as well as solving any video/audio problems before proceeding to the list of questions.

The interview questions were divided into three categories, first about the informant to determine their level of IT expertise, attitude toward IT as well as their position in the organization. We then proceeded to determine how the informants experienced the implementation of Microsoft Office Communicator and Live Meeting and if they had any prior experience with similar systems that could ease learning and adoption of new communication systems. Finally we spoke about how Communicator has impacted their way of working, including several questions where informants were requested to explain freely how they used Communicator in certain situations and why they did so. In some cases I was also engaged by the users as a sort of IT-support in answering questions they had about past and present systems but which they had not found answers to through ordinary channels. Their questions were themselves valuable information, as they to a certain degree revealed what issues had been forgotten or not properly communicated by those responsible for the implementation.

The answers were collated and arranged according to which question they belonged to in order to simplify analysis across respondents and ease the discovery of both general trends and significant deviations from them. Following the discovery of trends, significant deviations or other points of interest, all answers that were part of this were grouped and other answers, documents and other

sources of information searched to find anything more of relevance to the topic.

Some users were not interviewed as described above, but were selected on the basis of being known to have attended the Communicator training session and received an e-mail with questions specifically about this training. None of these answered the e-mail in time for inclusion in this project.

5.2.2 Interviews of Others

Some employees involved in planning and implementing the Unified Communication project were interviewed in an open fashion. This included the corporate-wide project manager, senior technical personnel specialized in collaboration and communication as well as three postgraduate students that had been employed by Statoil to look at collaboration and communication from a sociological perspective. These interviews with these were conducted with less preparation on my part than the end-user interviews, as these informants typically had a very clear idea on what topics they would speak about at length and also to a small degree which topics were decidedly off the table. My job as an interviewer was thus reduced to asking for clarification where necessary, recording and finally analyzing what they had said.

Table 2: Informants at Statoil

Informants, structured interviews				
Age	Years@Statoil	Education	Self-declared IT level	Norway
41	5	Computer engineer	Very good	No
49	3	IT (2-year)	Enthusiastic, better than coworkers	No
47	8	Information management	Relatively good	Yes
35	5	Industrial engineering	Poor, yet better than most my age	Yes
48	5	Geophysics	Good, know programming and Linux	Yes
43	13	Geophysics	Good at what I need, not the rest	Yes
31	6	Petrotechnology engineer	Rather good	Yes
44	7	Marine engineer (2-year)	Much experience, I get things done	Yes
26	2	Information management	I can do everything by myself	No
Other informants				
Project manager Unified Communication (first)				
Project manager Unified Communication (current)				
Research project facilitator, Leading advisor IM Architecture				
Team member, <i>New Collaboration @ Statoil and Information Management and Collaboration</i>				
IT professional, non-UC, former classmate				
IT professional, non-UC, former classmate #2				

5.2.3 Document Analysis

I received several documents that been created by the Statoil project team to plan the project and market it to senior management in order to secure their funding and approval. I also received some documents that had inspired the Statoil project team in their work, but that originated wholly or in part outside Statoil.

These documents were helpful in order to understand what Statoil wanted to accomplish by implementing Unified Communication and why they had configured the system as they had, as these factors will vary between companies and not always be in line with the benefits and recommendations used for marketing purposes by the manufacturer and/or delivery partner.

5.2.4 Personal Use of Systems

As briefly mentioned in the section about interviews of end-users, the systems being studied were also actively used to conduct interviews. They were also used to communicate with various Statoil employees about other matters. This provided hands-on experience and knowledge of the pros and cons of the various components in the Unified Communication suite independent of what came up during interviews.

6 Findings

6.1 Technical

6.1.1 Compared to Traditional Telephones

The informants were all positive to Communicator replacing plain telephones, some considered the telephony function the best part about moving to Communicator. A Norwegian informant used to reaching colleagues in Norway at any time by calling their cell phones was initially frustrated now working in the USA, where everyone are using landlines instead and thus leaving their phone behind at their desk. With the ordinary phone system the informant could not know in advance whether the receiver would be near his phone and thus many calls went unanswered or even rejected if the receiver was busy.

With the contact list I can see if people are actually available and not waste calls. If they are out I leave a text that they see when come back.

Another very positive user based in Norway tries to retire the cell phone completely for work:

I use Communicator almost exclusively, the sound is much better. I hardly call from my cell phone, but I receive calls to it. If it's colleagues I tell them to call me on Communicator instead, the sound is better and we can look at each other's screens.

The phone system should not be considered isolated from other factors at work, one satisfied user attributed several benefits of Communicator to changes in hardware and work environment that would have been possible without implementing Communicator.

First and foremost it's a relief to get rid of the cell phone. I use to work in an office landscape, if I was going to have a call I'd have to find a room for myself. ... Now I can sit comfortably at my desk with a headset and be on a conference calls for hours, without having one hand occupied with the phone. The phone function is possibly the best part of Communicator. I work in a separate office now, no longer in a landscape.

This informant has possibly gained a lot more from getting a headset, which no doubt would have been available for the cell phone, and moving from landscape to separate office, than from actually moving telephone calls from cell phone to Communicator. Yet still Communicator gets the credit for improving the work situation.

6.1.2 Compared to Other Systems

While the informants were very much united in their praise of Communicator over traditional telephones, opinions differed when comparing Communicator and Live Meeting to other systems such as NetMeeting, Tandberg and Windows Messenger. There was still a very positive general opinion, but not everyone had the same idea as to exactly what Communicator/Live Meeting was supposed to replace.

One informant had a very firm opinion when asked which systems were impacted by the

Communicator/Live Meeting implementation:

NetMeeting and Messenger. No influence on Tandberg. Though they are similar, they are for different uses and do not overlap.

This continued when questioned about other changes to the work environment as a result of this implementation.

No changes in travel. The Tandberg rooms reduced travel, not Communicator.

However, this same informant illustrated the lack of absolute reliability inherent to social science as opposed to the hard facts of physics and mathematics, by contradicting the above answers when replying to other questions:

Users with special skills can join in from their rooms without traveling and help us ... When people complain about not enough Tandberg rooms I try to make them use Communicator instead.

One informant found Communicator and Live Meeting to be the solution to nearly all communication needs:

Communicator pushed NetMeeting into retirement. No need for Windows Messenger for instant messaging. Hardly ever use Tandberg anymore, feels good to not occupy a Tandberg meeting room all by myself for video calls.

Another informant was also happy to not use a Tandberg-fitted meeting room, but for a slightly different reason:

We're all over the place. Only a few guys here, so all communication had to be done by telephone or NetMeeting. If we were going to do anything advanced we had to get a [Tandberg] meeting room, and to find a meeting room in this place... Had to book it two weeks in advance just to make sure we got one!

A third informant was less positive to using Office Communicator instead of Tandberg for video conferencing, but still found it an improvement over other systems:

Clearly better than telephone and NetMeeting. Better sound quality, and it's nice to see video of people. Tandberg is however even better than Communicator, I get to see people in real size and the sound is more natural.

A welcome change was the reduced use of e-mail. Several reported a sort of fatigue from getting so much e-mail, especially that which is sent to everyone in pre-defined groups, where the group can be as large as everyone at the entire company. Another source of e-mail fatigue is to receive copies of e-mails between others, while the copy is intended to keep the recipient up to date on a group project, no response is usually required, but every e-mail still has to be read to be sure. There are no such broadcasts in Communicator, users are aware that every message received through Communicator is part of a one-to-one conversation and targeted specifically at the single receiver.

It helps to have Communicator instead of sending lots of e-mails, but it hasn't entirely replaced it.

People ought to use Communicator a lot more, they send e-mails about such small things, filling up mailboxes. No need to send an email about going to lunch together or joining an impromptu meeting. Could perhaps just as well have used the phone for those messages, but Communicator is great because it doesn't require you to pick up right away.

Some informants were confused by the very close integration of Live Meeting with Communicator, believing Live Meeting to be just some sort of function within Communicator.

6.1.3 Other

While video and sound can be stored, searching is very difficult. Content management is a much greater challenge for video/audio conversations than for text-based conversations. At the same time audio/video is «richer» and considered more suitable for establishing new contacts and collaborating. Some employees are likely to be actively opposed to conversing with text. A combination of media types can be advantageous, combining «natural» conversations in video/audio with text messages for content that would be impractical to transmit in video/audio, such as long numbers and excerpts from documents that are already in text form.

Conversations are currently by default not stored, regardless of media type. Recording of audio/video is available both for Tandberg and Live Meeting, but must be enabled specifically for each conversation. Conversation history (instant messaging log) was enabled in the Communicator pilot program, but has been disabled in the full-scale implementation. There is still a need for traceability of some types of communication and decisions, but this is to be handled separately from the Unified Communication system.

Statoil intends to upgrade to the Lync family of products after the implementation of the current generation of Unified Communication systems have been rolled out to all locations and any technical problems been taken care of. Lync introduces new functionality, but is expected to be similar enough to Office Communicator that retraining in the common functionality should not be required.

6.2 Non-Technical

6.2.1 Social

The slogan for the Unified Communication program is «It's not about technology, it's about YOUNified communication». The basic idea underlying the project is to move the focus away from looking at the technology itself and instead look at how collaboration processes are affected by streamlining communication. At the same time this creates new challenges. Technology in the form of products can be purchased in the desired numbers and placed where they are wanted, yet this provides no guarantee that they are used as intended. So far, the barriers and problems that have been detected have been of a technical nature, but perhaps the most important problems go undetected if one only has the means to detect technical and not cultural problems. The project managers at Statoil are aware that major cultural differences exist, but they also know that they do

not know enough about just what problems are created by these differences, or even the details of how the various cultures differ. They consider it important to learn more about the cultural aspect of communication, not just providing a technically functioning system.

Communicator and Live Meeting can no doubt be said to be a richer form of communication than the older systems, which has led to some activities with a high demand for richness being able to fit within their use instead of requiring face to face meetings.

One informant even found Communicator to be preferable over face to face meetings for those difficult conversations when someone underperformed and had to be reprimanded. This is best done with those involved seeing each other instead of via text or telephone, yet the physical proximity of a real face to face meeting can make the situation more uncomfortable than what is really required or desired:

Communicator is less stressful, especially nice when there are uncomfortable issues, then not having to do face to face is good.

Another informant had transitioned from one leading position to another after receiving Communicator and found it invaluable in both. This informant considered close personal contact a prerequisite for truly being a leader and not just a manager or performance auditor:

In my previous job I was a leader for a lot of people sitting all alone in different places in Norway, had we not had camera and Communicator I don't think I could have been a good leader.

Another aspect of being a leader is making the difficult choices and having the difficult conversations:

Communicator makes it much easier to stay close. As a leader I have many difficult conversations, these are easier when I can see the person I'm talking to. Personal conflicts are always difficult, but also professional disagreements on technical issues can be tough. Handling professional disagreements is so much easier when we can see each other, compared to talking on the phone.

Some informants expressed difficulty in remembering how they had communicated certain messages. They could recall seeing it as text on screen, but not the specifics.

I keep confusing instant messages and e-mail. Two weeks after a conversation I dig through my e-mails to find out just exactly what someone said, but then I realize that we were using instant messaging and that the conversation is gone.

This was not entirely negative though:

I don't want conversations to be saved automatically. One just has to be aware that it disappears unless intentionally saved. It is comforting to know that it isn't saved automatically, I really wouldn't like conversations about social or work-irrelevant matters to be saved.

That the text conversations are not automatically saved like e-mails was generally not considered a problem, and the e-mails that are automatically stored were not appreciated for their ability to keep track of who said what. The communication happening while important decisions are being made was not considered important, only the end product:

The big problems are never handled by someone working alone in their office. They are handled by groups of smart people working together and communicating throughout the entire process. The final decision is what matters, and those decisions are written in formal documents. It just doesn't happen that decisions of great magnitude are made as a result of e-mails back and forth, they're done in meetings with proper meeting minutes. There should not be a need for forensics and traceability afterwards, those involved all have an obligation to make sure that the document contains everything and is correct before it is committed. If anyone feels the document is wrong or leaves out something important, don't leave the meeting until it is put right.

Most people deviate from the golden rule at times, Statoil employees are no different, as one informant clearly displayed:

In instant messaging people sometimes don't answer right away, so I force quick answers from people through using the phone function instead. At the same time I prefer being contacted through instant messaging because it lets me think things through.

Another informant had the opposite idea about what kind of communication is the faster type:

Telephone calls are too social, too many customs. First there is the greeting and asking how they are doing, then when my actual question is answered I can't hang up without completing yet another set of polite phrases that add no value. With instant messaging it feels okay to just send the question without inflating the session by wrapping it in politeness.

A third informant was more laissez-faire about communication and haste in general:

I like instant messaging, it lets me decide when to answer. [The taskbar button] can keep flashing, I don't care. I don't get phone/video calls, so I haven't got an opinion about those.

Another field that saw diametrically opposite views was the use of telephony in office landscapes. One informant first received Communicator while having a leading position.

There was no way I could use it as intended, I can't have conversations about leadership-related issues while in a landscape with others hearing what I say. Except for that it is brilliant!

Despite being very fond of Communicator this informant sees problems, not with the system itself, but its application in a situation it was perhaps not designed for. Other informants had differing views, one worked in a landscape environment where there was constant sound of conversations face to face, so it was perfectly acceptable to do phone conversations on a headset without leaving the landscape, those conversations would be about issues that were not required to be kept secret from colleagues. The sound level could at times be so high as to require relocation to silent rooms just to be able to hear the person on the other end of the call. Another informant worked in a landscape with a «quiet culture» where any sound was frowned upon and anyone expecting a phone call was encouraged to leave the landscape area in advance, the implementation of Communicator

had led to a transition from people wandering in and out with cell phones to people doing the same wandering with laptops and headsets.

Wandering about with laptops is not always easy, but Statoil is making an effort to improve the situation. A project to replace the majority of client computers runs simultaneously with the Unified Communications project, one goal of this has been to increase the portability of employees. One action toward this goal is to provide as many employees as possible with laptop instead of desktop computers, as well as providing wireless networks so that the laptops don't lose their connection to the network while in transit between locations. One informant had already had a laptop computer at work even before this project, but the actual portability was somewhat limited by the less portable network connection:

If the call is a planned one I relocate to one of the silent rooms in advance and log in to Communicator there. [If unplanned] I receive it on my cell phone and run to a silent room. I sometimes use the function to transfer from Communicator to cell phone if I get a call on Communicator. I've got a laptop, but it's in a docking station. I can't just grab it and run to a silent room, it'll be offline and the call lost by the time I get there.

In the interview with the project manager she spoke briefly on the use of audio/video calls in landscapes. While it was clearly desirable to come up with common guidelines for all of Statoil in order to streamline communication across departments/offices, common guidelines would necessarily conflict with at least some of the department/office cultures already in place, seeing how different the various department/office cultures are today.

The project manager had found some departments and professionals to be very wary of using Communicator and other «modern» means of communication. This was especially prevalent among those working in legal and HR, for whom privacy and secrecy is of paramount importance. They will never feel comfortable having a phone conversation about sensitive matters while seated in a landscape where they can be overheard, even when those overhearing are close colleagues. Further inhibiting their adoption of Office Communicator is the formal requirements put on much of their communication, especially regarding traceability and form.

For use in landscapes in general, the need for guidelines and a joint culture is steadily increasing, as the number of employees working from personal offices is steadily decreasing. Even many senior leaders are now located in landscapes. New office buildings are given interior plans that support the use of Office Communicator video/audio-telephony, with every landscape area getting a handful of small (single person) silent rooms close by. These are also fitted with fewer Tandberg systems than would have been «appropriate» if compared to existing offices and Tandberg usage there, but Statoil considers this to be unproblematic as so much Tandberg usage today is by single workers who need to use a silent room for videoconferencing but have no need for the extra seats of a «real» meeting room nor the Tandberg system's superior handling of multiple users at a single device.

6.2.2 Training and Communication

Just one of the informants working in Norway had attended the training class that was offered at different locations over a significant period. Partially as a reaction to the poor attendance during the

roll out in Norway, attending class has been made mandatory in all locations outside Norway to receive the hardware (headset and web cam) required for Communicator video calls. The one informant who had attended was not overly impressed by the class itself:

A lot of things were left out. Much time spent on basic things we already knew, while time ran out before we could get to what we actually needed to learn. Very varied starting level for the different attendees, some had no clue, others were used to this sort of system and didn't really learn anything useful ... Best part of the class was getting the printed quick guide, I've used that a lot afterwards.

One informant working at the Forus office was not even aware that a course was being offered, despite there being large posters about the course at every major entrance to the Forus buildings. Other informants were aware of the course, but had not attended for various reasons.

I was going to attend, but never got around to actually doing it, and now I'm probably on a level where there is no point in attending. I like going to courses like these, I usually pick up something useful I haven't discovered on my own.

Another informant with a positive impression of Communicator and a very positive attitude to technology in general was less convinced of the value of such a course.

It's so intuitive, there's just no need for training. Generally if a system is good there is no need for training. I just click all the buttons and see what each of them does!

Possibly related to the poor attendance at the courses was the finding that most informants had no idea why Communicator was being implemented. Indeed, the only informant who was aware why it was coming was the same person who was unaware of the courses being offered next door, and that knowledge stemmed from previously having worked alongside some of the people responsible for the implementation project, not from any planned communication effort integrated with the project. Another informant assumed it was due to an increased demand for video conferences and there never being enough Tandberg rooms to meet that demand.

The poor attendance at the courses as well as the limited communication about the new system probably led to two other issues I observed. One of these directly influenced how people used Communicator. When asked about what influenced their choice of communication system when contacting someone, one informant had adapted to the lack of a common minimum level of Communicator skills.

It depends on what I think the other person can handle. If I'm not sure they can use Communicator, I contact them by e-mail or regular phone. I don't initiate conversations in Communicator unless I'm absolutely sure they know how to respond.

The other issue possibly attributable to poor attendance and limited communication is the continued use of the formally deprecated NetMeeting system. Live Meeting is better in every way, yet people still use NetMeeting partially because they are not aware that there is a replacement. The implementation project has tried to make people quit using NetMeeting through shutting down its catalog server, so while each client still works, connections can no longer be made simply by adding named participants from a directory. Instead, each client must be added through manually typing its IP address. Some persevere, others start looking for alternatives and transition to Live Meeting when they discover it.

Getting started with Communicator went real quick as soon as NetMeeting stopped working properly. Other people still want me to use NetMeeting, but that no longer really works well when you have to type these long numbers. Reading all these digits out loud over the telephone, they keep getting jumbled. ... [On being told of the Internet Locator Server being shut down intentionally] So that's why it doesn't work? Makes sense to do that, but nobody told us about it!

A third issue shared among some informants despite the solution being easily accessible through Entry, the Statoil intranet, was the perceived impossibility or difficulty of adding contacts from outside the statoil.com domain.

Why can't I add external contacts to my list? I used to be able to do this in the old system [Windows Messenger], that was valuable, especially seeing their presence status.

Whenever an informant raised this problem during interviews I made sure to provide them with a link to the relevant Entry page at the end of the interview. The e-mail address of external contacts can't be added directly, it must be slightly edited to work, thus causing those users who were used to Windows Messenger and its tolerance of plain e-mail addresses for external contacts to experience failure when attempting to add them the same way in Communicator.

This issue of not looking at Entry when encountering problems with Communicator was corroborated by the Unified Communication project manager. Entry pages related to Unified Communication had very few hits, and without means of measuring actual use of Communicator, number of related page hits was used as an indicator of adoption of the whole system. This in turn lead the project manager to believe that Communicator had seen only limited adoption in Norway.

Another issue regarding Entry brought up by the project manager was to keep people coming to Entry for news and information. Though not implemented yet, Communicator has the capability to display a banner with content created by Statoil. This may be used to broadcast news and information and so may partially overlap with Entry as a source of general information. One concern for the project manager was that people might stop going to Entry and instead trust the broadcast banner in Communicator to keep them informed of any important news. (ibid.)

The support system provided by Statoil was generally not used much. One informant had been involved in the pilot program, in which they had a local person on call in case of problems. After the end of the pilot program they lost this local person and must use the ordinary support system, with which this informant had less than stellar experience.

I had some problems with the Teamsites, they had me use some support service in India. 20 e-mails back and forth for the simplest of issues. Took a week to solve a problem that could have been solved in minutes on the phone with someone local. Haven't bothered contacting support for my problems with Communicator, after we lost our local guy I guess they moved that to India as well. Had there been Norwegian support my threshold for contacting them would have been lower.

Note the assumption that support for Communicator is not Norwegian and not available via telephone, without ever having tried getting support for Communicator as currently supported. One of the project group members was able to confirm that Statoil does indeed offer first line support by Norwegians via telephone.

Other informants avoided using the support service as well. A single informant reported looking at the Entry pages for a FAQ or similar, while several others reported turning to their closest work colleagues or fellow meeting participants. The single Norwegian informant that had attended the introduction class had kept the printed quick guide provided there and used it as the first resort in case of problems, finding it quite valuable.

Just one informant working in a small location outside Norway reported having the IT-support unit as a natural starting point when solving problems, this informant is an IT-professional and is unlikely to have any colleagues nearby with a higher level of IT-competence. Another informant working outside Norway mentioned having considered to ask the local IT-department, but deciding against it as «they are probably too busy».

Project group members were aware of some existing problems with IT-support usage, noting that some problems/issues were reported to IT-support, yet these were not registered for analysis in order to make IT-support more efficient in the future.

One «support service» that did see use among several was simply asking colleagues nearby. One informant reported having a handful of colleagues in particular that were known to be able to fix nearly all problems in nearly every system, so if this informant was asked for help he would forward the question to one of these colleagues who would then spend a little time acting as a support service instead of performing their normal job.

6.2.3 Working from Home, Reducing Travel

Several informants reported occasionally working from home, stating various reasons for doing so.

I've got small children at home, they get sick now and then. With Communicator at home I can still partake in meetings, that's a great advantage for me. I'm involved with platforms, they operate around the clock, 24/7. If anything happens I'm available at any time, it's great to be able to connect and get eye contact with the installation manager. ... I don't feel any pressure, I'm a real workaholic and find it fantastic to be allowed to use my head more hours of the day!

Another informant had extensive contact with engineers working a different schedule than himself, both those working regular office hours in other time zones and those on platforms where there is activity 24/7:

I don't feel any pressure about being available all the time, I'm relaxed in that respect. If there is anything special going on in the USA or at sea I just adjust my working hours accordingly, I go home early and work the remaining hours from home in the evening. ... I try to get my job done whether I'm here or there.

A third informant frequently worked from home, but without Communicator:

Never used it [Communicator] from home, but I can if I want to. Part of my job is to handle

access control, I just watch my e-mail and phone in case someone needs access [when I'm home]. Doesn't bother me, it's so rare. I usually get advance warning that I need to be available that evening.

A fourth informant was uncomfortable with air travel itself, even for short domestic round-trips that did not extend outside normal working hours. Severely reducing the amount of plane trips had made him enjoy his job more.

Not a single informant reported feeling pressured into being available at home. Some were not aware that access from home is possible, others were aware of the possibility, but did not know to what extent they would have the same applications/systems available as at their ordinary work computer in the office.

6.2.4 Presence Information

Several informants used the presence information displayed in the Communicator interface for purposes beyond communicating within Communicator. The most common such usage was to check if people were available for a face to face visit. A few did not take the presence information at face value, starting their communication by asking via instant messaging whether the receiver truly was available, possibly escalating to a «real» audio or video call when availability was confirmed.

The presence information is displayed both in Communicator and in Outlook, one informant reported specifically choosing Communicator when checking if people are available, as Communicator has a more «lightweight», less cluttered interface than Outlook. Another informant preferred Outlook when looking for people not already on the Communicator contact list, as she found Communicator to be very closely oriented toward searching with a name, while she often did not know the name of the person she was looking for, only their position in the organization. For finding people from other criteria than their name, the more complex interface in Outlook is the better one.

Two informants had not found much use for seeing presence information. One of them worked at a small «satellite» office where the presence status of every close colleague could be ascertained simply by standing up and looking around, thus presence information was more meaningful for the infrequent communications with people in other locations. The other informant with little use for presence information had a job where she would sit alone, deeply immersed in thought. While she considered Communicator a good product that does what it is supposed to do in a good way, communication systems in general had little relevance for her ability to work effectively.

Users had varying attitudes and habits relating to actively setting their presence information beyond what is done automatically as a result of calendar information, active audio/video connections and certain applications that run full-screen. One user reported setting the presence manually when handling complicated cases where incoming calls would be overly disruptive:

[I've] done it a couple of times when I need to finish things. [Communicator] makes one very easy to contact, and when one is easy to contact... Especially when I handle

complicated cases I set my status to «Busy», but then I really am busy! People check my calendar, and if I don't have anything scheduled there and I'm «green» they call me. I like to schedule «appointments» with just me alone in the calendar, that way people can see that I have a task I wish to complete.

This habit of scheduling appointments with just oneself had been observed by another informant:

I don't [set presence status manually], but maybe I should? We usually check the calendars of others to see if they are busy, but not everyone are equally good at using their calendars actively, so we can't really trust that information.

...

[People] decide to concentrate on something for a couple of hours, they enter a meeting with themselves into the calendar and they appear busy in Outlook and Communicator, even though they are still at their desk and in principle are still available. It's important to be conscious of the signals one sends out!

Through my own use of Communicator I discovered one user who had his presence status constantly set to «Away» and who had chosen to hide the content, but not the times, of his calendar appointments, somewhat undermining the value of presence information.

In meetings with project team members they informed me that the calendars and presence status of the Statoil upper management would be hidden automatically, as these top executives were so frequently involved in sensitive matters that their calendars and presence status should be protected from anyone not specifically cleared to view that information. Another piece of information regarding intentional limitations was that external contacts (outside statoil.com) would have «reduced» access to presence information.

A number of informants did not actively set their presence status, for various reasons:

No, I don't get bothered that much. I know it's possible though.

-

No, I should, but I keep forgetting it!

-

No. I'm good at multitasking, I can handle lots of open windows at the same time. I know others who can't get any work done if they're on Communicator.

-

Only once or twice. Those were extreme situations, [manual status changes] are certainly not a habit.

-

No. I'm not that busy. I do get a lot of requests every day, but not enough to make it a problem.

-

No. I am generally not used to changing my status at all.

The latter informant is the same person who works at a small office and could ascertain the status of colleagues simply by looking around.

6.2.5 Unorthodox Use

Not all use was equally «buttoned down» and strictly professional. Several informants reported using instant messaging for purely social communication, typically talking to colleagues who are also friends and where ordinary conversation face to face is either impractical for reasons of distance or would be disruptive to other people nearby. In this respect, Communicator can be said to serve as a «digital watercooler», an arena for social contact independent of lunch breaks and other formally defined breaks where talk about non-work related issues is expected and accepted. This effect had also been observed by Larsen (2010), where users in the pilot project reported that the breaks to fetch coffee got shorter and less social as much of the informal communication that had happened at the coffee machine now took place via Communicator with the employees still seated at their desks.

One informant reported experiencing a number of colleagues using Communicator for work-related communication, yet with a substantial dose of humor involved by using the camera software to alter their video feed.

[Colleagues] use these fun functions, getting the computer to show them as a shark, or maybe those characters from the Avatar movie, or put on them a king's crown. ... It's motivating to see colleagues draw so much fun from a work tool, yet sometimes it gives me a feeling I'm outdated and old-fashioned. Even colleagues old enough to be my dad will play around with video.

6.2.6 Financial

While documenting the financial impact of implementing Unified Communication was not the objective of this research project, some information on this topic turned up regardless and is included for completeness.

Two of the goals of the Unified Communication project were reducing travel cost and telephony cost. In the interview with the project manager it came up that actually measuring these reductions with any kind of good accuracy will be hard, as Statoil globally has a large number of suppliers of telephony and travel services and that they do not have a good overview of the total sums involved. Some informants reported a dramatic reduction in travel as a result of the Unified Communication project, and while I will not delve into details on the costs of travel versus implementing and running the Unified Communication systems, it appears likely that the net monetary result of the change is positive.

Another financial impact of implementing Office Communicator and Live Meeting is reducing the need for Tandberg systems. While Tandberg is unlike Office Communicator well suited for multiple participants at either end, the cost for each unit is also significantly higher. If individuals use Office Communicator instead of Tandberg for their video conferences, the need for Tandberg-fitted rooms is reduced and large cost reductions are made possible. Statoil expects that around 30 % of rooms

originally intended to use Tandberg could instead be fitted with vastly cheaper systems for Office Communicator with no significant loss to videoconferencing capacity. Multiple informants reported having changed from Tandberg to Office Communicator when they are alone in their end of the video conference. One informant had not thought of the possibility to replace Tandberg with Office Communicator until the videoconferencing-based interview, but was inspired by the interview to consider Office Communicator for future video conferences.

[Office Communicator] I mostly use for text now. So far I've been using Tandberg for video, but now I see how easy it is to take the video gear for Communicator along where I need it.

A single informant reported still preferring Tandberg for meetings planned in advance, with Office Communicator more as a reserve in case no Tandberg rooms were available.

Unified Communication brings a cost beyond the obvious of software licenses, headsets and webcams: Increased network traffic. As use of the telephone network (landline as well as cellular) decreases, traffic on Statoil's own data network increases, necessitating upgrades that are not free.

If the reduction in travel costs are kept out of the equation, Statoil does not expect to actually reduce spendings on communication by going from legacy systems to Unified Communication, but instead they expect to get better communication in return for the same spending.

7 Discussion and Recommendations for Statoil

7.1 *Performing to Expectations*

7.1.1 Systems

Communicator and Live Meeting have clearly lived up to the expectations set forth by the Statoil project team as well as Microsoft and Atea by succeeding in offering easy video conferencing to users. Not all users have found a use for this however, but the absence of complains of difficulty or problems involved can indicate that their non-use is founded in a lack of demand or perceived value rather than technical barriers.

Users are relieved to have a good alternative to Tandberg, enabling them to partake in videoconferencing without occupying an entire meeting room alone, behavior that would trigger a feeling of guilt in some informants.

Telephony is also a clear technical success. Not a single user reported preferring traditional telephones over the new integrated system, and where it has seen limited use this is not due to problems with the system itself, but due to the concept of telephony being considered unsuitable for the situation or context the communication exists in. Examples of this unsuitability include use in landscapes where fellow workers expect sound levels to be kept low and/or where the content of the communication is too sensitive to be broadcast to those nearby. Another example is those situations where a purely voice-based system is considered to have insufficient media richness, as described extensively by one informant who was also a leader. This corresponds with Ackerman's (2000) observation of the need for nuance and detail, discussed later.

Telephone usage may have decreased despite the improved quality of the service, as another service was introduced prior to or concurrently with (depending on location) pc-based telephony: Instant messaging. While instant messaging was present prior to the introduction of Office Communicator through Windows Messenger, its use was restricted by its limited functionality. With the introduction of Office Communicator, Statoil has a system of greater communications value than the sum of its parts. This agrees with the research by Lei and Ranganathan (2004); by reducing the number of devices yet retaining the full set of services, Office Communicator is able to offer the most appropriate service for any situation.

Boettner et al (2009) warns against increased complexity in systems capable of handling multiple types of communication, but among the findings in this research project there is little to suggest that this is a problem at Statoil. This may indicate that the product and configuration chosen is of high quality, that it despite being a complex system manages to present a non-complex interface to end-users.

Another, less positive explanation can be created based on the research design, where most informants were recruited through calling for volunteers. Volunteers are not necessarily representative for the overall user mass, as those especially insecure or unskilled may be less

willing to come forward than those confident in their abilities. Also, every informant could be assumed to have at least a minimum of technical training as a result of their education. Statoil has a large number of employees that do not necessarily have technical training, such as those educated in law or business administration, for these learning a new system such as Office Communicator can be a greater challenge than it has been to engineers and geophysicists who will have had at least a little computer education while pursuing their degree. To sum up, there may be substantial groups of users with problems that have gone undetected by this research project.

7.1.2 Processes

The idea from the Unified Communication project team that the implementation could change how and when people work appears to have come through. Two informants directly attributed some of their work from home to be due to having Office Communicator available at home, enabling them to adapt their working hours to fit remote operations taking place outside their «natural» office hours as well as freeing them from choosing between taking care of sick family members and doing their Statoil job, enabling them to do both at the same time.

A third informant could confirm the increased availability of some professionals as Office Communicator lets them apply their special skills to projects in different location. While these could no doubt have attended some of the projects by travelling to their location, this would have increased unproductive time spent travelling, reducing their time available for other projects and keeping them away from family and friends.

These results are fully in line with the benefits Atea claim in their marketing to be gained by implementing Unified Communications. However, a significant degree of flexibility already existed, as several informants reported having worked from home using various systems even before they received Office Communicator. Implementing Unified Communication may thus have improved upon existing flexibility, it did not create flexibility where none existed before.

7.1.3 Privacy and Awareness

Only some informants used the available functionality to change their presence status, additionally most assumed that others did not at all times maintain the «appropriate» presence status, which then resulted in somewhat «insecure» communication, with conversations starting with getting confirmation that the receiver truly is available and has not merely forgotten to change the presence status to indicate that he or she is actually busy.

Some used the calendar to make appointments or meetings with themselves as the only participant. This indirectly sets Communicator to display a «non-green» presence status, while setting such as status directly in Communicator does not correspondingly indirectly place an appointment in the calendar. This one-way effect is sensible considering the amount of information required to create a meaningful calendar entry and also to aid the user in avoiding the complexity Boettner et al (2009) warned against. If Communicator was hard-wired with the calendar and thus set to require the full amount of information for a calendar appointment to allow a presence status change to «Busy», the user would be forced into an unnatural interaction with the system. If the user is not allowed to

easily set the status as desired, potentially overriding information inherited from the calendar, the outcome could be that the users gave up on using and trusting presence information altogether, hardly a desirable outcome.

Communicator does offer the option of writing a «note» in order to broadcast information beyond the simple presence status, but this is not directly linked to the calendar. Notes are not copied to the calendar as a sort of appointment, nor are the details of the calendar appointment copied to Communicator as a note, the presence of an appointment only modifies the presence status itself.

The habit of inserting one-person meetings in the calendar may be behavior lingering from before users received systems where presence status could be set directly. In the absence of a simple «traffic light»-system for presence, shared calendars were possibly the easiest way of broadcasting whether one was likely to be available or not.

Statoil appears to have succeeded in creating a system that allows its employees «appropriate obtrusiveness» (Schmidt, 2002), and even though the unification of Unified Communication and calendar is not absolute, it is still fit for purpose.

Privacy appeared to be of little concern to the informants, with not a single one reporting any attempt or desire to conceal their own presence status or calendar information. Perhaps the closest we got to finding any concern for privacy among informants was how one of them considered the intentionally disabled function for storing instant messaging conversations a relief. The resulting non-permanence of instant messages may help them being perceived by users as a good alternative to the voice-based media such as telephony or face to face conversation, making instant messaging especially suitable for use in landscapes where noise reduction and protection of sensitive information is a concern. Had the instant messages been stored it could have made users less spontaneous and more guarded in what they write, possibly leading to increased use of the non-permanent voice-based media with their unavoidable disadvantages in landscapes.

The only indications of privacy issues directly related to presence information was in how the top executives were automatically concealed from anyone not specifically authorized to view their information and the one regular user I observed keeping a constant «away» and concealing the contents of his calendar appointments. Having the presence status constantly set to «away» is not an entirely new behavior to this researcher, I have seen the exact same thing being done by acquaintances who wish to have a choice of which requests (and contacts) to answer and which to ignore. Eventually this undermines the value of presence information, a case of «the tragedy of the commons» (Hardin, 1968), somewhat similar to the one user who preferred to receive questions via instant messaging in order to buy time to think, yet would use telephony to pose her own questions in order to force an immediate answer.

7.2 «It's ~~not~~ about Technology...»

7.2.1 Communicating Communicator

The slogan of the project was «It's not about technology, it's about YOUnified communication». The idea was to move away from a technological focus and instead look at processes performed by people. It is then interesting to see that while delivering the technology to users appears to have been a clear success, actually communicating the change to these «YOUUsers» and training them was only partially successful.

Some informants reported an inability to add external contacts to their Communicator contact list, a feature they had appreciated in the past while using Windows Messenger. How to add external contacts is clearly described on the «Entry» intranet system, on a site easily found if looked for, yet this had not been discovered by these informants. Larsen (2010) did during her research on the Statoil Unified Communication program discover that some users were afraid of missing out on important functionality if they were left to discover Office Communicator by themselves instead of going to class or receiving handouts. The inability of several users to add external contacts despite the information being easily found if actively sought appears to confirm the validity of Larsen's findings as well as the project management's decision to make classroom attendance mandatory following initial experiences from the rollout in Norway.

At the same time making classroom attendance mandatory is at odds with the recommendations of the Collaboration Consortium (2009), which specifically recommended letting users choose for themselves through which means they wanted to receive training in order to let each learn according to their learning preferences.

Forcing employees to receive some sort of training instead of relying on them to choose voluntarily to attend «unproductive» training instead of their ordinary work is in line with Bradley & Shah's (2010) claim that users are the weakest link of a Unified Communication system and must be given training and guidance if they are to truly embrace the culture of Unified Communication. There may be a number of reasons why employees offered a course choose not to attend. Among those explanations that came up among the informants in Norway, all appear to be either a product of free will, i.e. «I didn't need it», or from not being aware that a course was even offered. None reported feeling any pressure from colleagues or superiors that they ought not leave their ordinary, directly productive work for the (short) duration of the course. Evidence may be thin, but findings both directly from interviews and from experiences while physically present at Statoil offices indicate that there is a high level of acceptance that employees must be allowed and encouraged to «grow» and learn even when this means the occasional absence from the task(s) they are paid to perform.

The Entry pages about Communicator were generally not used much, as the project manager was aware of early in the implementation. The project manager's worries about users of Communicator ceasing to use Entry if news and information are broadcast through a banner in Communicator are possibly misguided for at least some users, as they appear to not be using Entry even before the Communicator banner has been put to use.

Another case of possible insufficient communication was illustrated by the informant working at

Forus who was not even aware that the introductory classes for Communicator existed, despite self-describing as not very IT-competent and interested in receiving more training.

A third case was the confusion as to why Netmeeting had become so hard to use. The directory system for Netmeeting, *Internet Locator Service*, that greatly simplified its use had been shut down to force the transition to Live Meeting and Communicator, yet news of this had clearly not spread throughout the organization. Larsen (2010) warned of the dangers of allowing legacy systems to live on even as their replacements have been deployed, as users may choose to continue using the legacy system they know instead of learning the replacement. This warning was heeded to a certain degree with the *Internet Locator Service* being intentionally disabled in order to render NetMeeting impractical to use and force users to transition to the Unified Communication suite, yet with the NetMeeting application itself still installed on most computers the most persistent users stuck with it, perhaps not very surprising considering how they claimed to have not been informed that NetMeeting should go.

Important to note in all three cases however is that their generalizeability even within Statoil may be low as each of the issues were reported by just one or a few informants. While the problems expressed by these informants is no doubt real to the informants who experience them, there is not enough evidence to claim that the problems are widespread throughout Statoil. Considering that classes were made mandatory in locations outside Norway, these problems are likely to be limited to Statoil locations within Norway.

7.2.2 Communicator Gets the Credit

A few informants attributed benefits to getting Office Communicator or Unified Communication that were not really directly related to any of the systems as such and could have been achieved without the Unified Communication project. Specifically one informant attributed vastly more comfortable telephony (hands-free use and less noise) to the project, while there had really been two important changes to this informant's work environment that were fully independent of Unified Communication: The informant had received a headset, which no doubt would also have been available to any non-exotic phone at very little cost, as well as moving from a landscape to a separate office.

Another informant reported instant messaging to be more efficient than telephony, as with instant messaging there was no need for the time-consuming social customs of telephony, including greetings at the beginning and again at the end of each call. There is no technical reason why telephone conversations must include these greetings or follow any established cultural pattern, so theoretically they could be adapted to be more like the efficient instant messaging conversations, especially when using any client where the person receiving the call can see the identity of whoever is calling, obviating self-introduction from the beginning of each call. Established cultural patterns may be hard to change, especially if the person must change back and forth depending on the context, such as using the «efficient pattern» when talking to Statoil colleagues and «traditional pattern» for everyone else.

A potential problem if there were to be made changes to how telephone conversations are handled is

maintaining the nuances present in communication, where forcing a «unnatural» pattern onto users may restrict their ability to express fine details important to the communication (Ackerman, 2000). Instant messaging already has severe limitations on communicating emotions and nuances in general, a trait it shares with E-mail. Presently workers at Statoil handle this by choosing telephony or video calls when they want the increased capacity for transmitting emotion and nuance available through these channels, especially when it is necessary to demonstrate that the issue at hand is of a purely professional nature and should not be interpreted to be emotionally loaded.

7.3 Recommendations for Statoil

7.3.1 Establishing Standards

The two biggest issues preventing optimum use of and benefits realization from the implementation of Unified Communication at Statoil appear to be the lack of standards in both skill level and communication culture. Several informants did not possess the necessary skills to benefit from core functionality in Office Communicator, as illustrated by the problems faced by some of those who wanted to add external parties to their contact list, and also by those who were reluctant to contact others through Communicator due to a realistic concern that the receiver might not know how to handle that type of activity.

Statoil is aware of the importance of training, seeing as they made training mandatory in all locations that received Communicator after the initial roll-out in Norway. At the time this research project was conducted they had however not made a decision to apply mandatory training retrospectively to the users in Norway. Considering how the headquarters and a majority of employees are located in Norway this means a large group of users will continue to have insufficient skill to fully realize the potential benefits of Unified Communication.

One possible way to make sure all employees in Norway get the required minimum of skills could be to make training mandatory when Lync is deployed in the not too distant future. Although Lync has enough similarities with the currently deployed Office Communicator 2007 R2 to not require retraining for those who already have a good grasp of the basic functionality, there are also new functionality that could require training. If attending this training is made mandatory and at the same time is used to measure the course participants grasp of basic functionality, those who at the time of Lync-specific training are still below the minimum level required for effective use of common functionality can be identified and provided with training tailored to correct those areas where each user has the greatest need.

The other major lack of standards is that of communication culture. In some landscapes voice-based communication is acceptable, in others it is not, while others still have no clear rules or norms. Some users work in separate offices where noise within reasonable levels is of no concern to even the closest neighbours, others have their desk in a landscape but can quickly relocate to silent rooms should the need arise, allowing them to engage in voice-based communication given just a little advance warning.

As more and more users get laptop computers it is getting realistic to expect them to leave their

desk in the landscape and head to a silent room should they engage in voice-based communication. The limiting factor here may be the buildings and office landscapes themselves, as making users more portable may be of little use if they have nowhere to go. While putting everyone in separate offices could be ideal for the use of Office Communicator, that is not realistic or even desirable due to external factors. With continued and increasing use of landscapes it becomes vital to ensure that all employees not working in a noise-accepting environment have adequate access to rooms for voice-based communication. Only when an overwhelming majority of users are able to receive voice-based communication without necessarily receiving advance warning can the richer media (voice and video) become the default choice for communication.

Reconfiguring buildings to create these rooms takes time and is in itself disruptive and noisy, but at some point it must be done if a culture where «everyone» can benefit from voice and video communication is to be created, so it might as well be done as soon as possible.

Two alternatives to large-scale reconfiguration of buildings exist, but while both would be cheaper in the short run, neither is likely to be better in the long run. The first would be to design a culture of noise-acceptance, where everyone, everywhere are allowed to take their voice and video calls while remaining at their desk in the landscape. While this solution costs nothing to implement, the indirect cost in terms of reduced productivity due to various problems all triggered by noise could make it a very expensive solution in the long run. The second solution would be to tag everyone with the «quality» of their work location, where those in single offices or other environments suitable for voice and video are designated as such and encouraged to use the richest media while others with less suitable environments are given corresponding tags and miss out on some of the opportunities they could have had from the Unified Communication suite. Again this would mean giving up on productivity gains and maybe even be cause for resentment between employees in the various categories.

7.3.2 Turning the Communication up to Eleven

While it is hard to come up with a specific recommendation on how to solve this problem, it still must be mentioned: Too many users know too little about what is going on in terms of work-related IT. As illustrated by those clinging to NetMeeting long after superior products had been made available and the directory service for NetMeeting disabled, as well as those who could not get external contacts into their Communicator list while ignoring the detailed guide easily found on Entry, users demonstrate a remarkable ability to *not* receive important information when it is broadcast, nor know where to look for it even when they feel they need it.

One possible solution would be to «shout» more, but at the risk of drowning more important information and even reducing the total information intake if users cross the border into information overload. To increase the information flow to users appears to be the solution currently being tried by Statoil, seeing how they are planning to open an extra channel of information by adding a banner to the Communicator interface. Multiple departments in Statoil vie for use of this banner space, it is an arms race between well-meaning yet competing entities that may end up being detrimental to all of them.

The opposite could also be a solution, reducing the information flow, having users actively seek information instead of throwing it all at them. The unsolicited broadcasts could be reduced to merely link to where the advertising department or functional area store their actual useful information. The disadvantage of this approach is that it only works if all parties currently pushing out information agree. Whoever withdraws unilaterally from the shouting match will only achieve to render themselves invisible to the user whose attention they seek.

Common to both solutions is the need for central coordination of what is actually transmitted and how. There could be standards and limitations to how many and how big broadcasts may be sent to any one user in a given time period, as well as standards for formatting and classification.

During my time at Statoil I received only a handful of these broadcasts as E-mail, which meant I had no problem reading every one of them and making an educated decision on what information I could ignore. At the same time the front page of Entry contained a bewildering selection of information, ranging from truly useful for the majority through possibly useful for certain groups to hardly useful to anyone, but possibly mildly interesting or entertaining to those who know the person, project or department involved. I am not advocating sending more important information as E-mail, I know that many employees already receive far too many E-mails that are directly related to them or their work and that E-mail broadcasts are likely to be ignored. My recommendation here would be to have stricter rules on what degree of usefulness or general importance is required to get an article on the front page of Entry, cleaning up the communication so that a higher proportion of the information any employee must process before remembering or discarding is truly important and/or useful to that employee.

8 Conclusion, Limitations and Implications

8.1 Conclusion

Communication between humans is fluid and nuanced, often hard to fit satisfactorily into a technical product. The different communication media offers different characteristics, each being a trade-off between richness and constraints. Which constraints can be accepted and which cannot will vary between different contexts, leading to a multitude of media all in parallel use. No media is the *correct* type for every context, instead one must balance the characteristics provided by each media type against the requirements of the situation to discover the least flawed solution. This is the key to answer the first research question.

To make it easier to find and employ the optimal communication media for any situation it is beneficial to reduce the number of devices or systems the user must relate to, ideally gathering as many media types as possible into as few devices as possible. This is Unified Communication.

Statoil and the Unified Communication project team has succeeded in implementing an advanced technological system that integrates functionality from a number of different sources into a single interface.

What makes it somewhat less than an absolute success is through no failing of the technology itself, which to every reasonable criteria appears to perform exactly as it should. The problem lies with the context the technology operates in, specifically users that are unable to fully realize the benefits the technology could have provided them if they were to embrace it, learn it and discard inferior legacy technologies they have grown accustomed to.

The users are not entirely to blame, they work in an environment that limit how they can communicate and by extension what technology it is meaningful to apply to their needs. Even so, some users are not communicating optimally even within the confines of their environment. This appears to be due to lack of skill brought on primarily by insufficient training and a number of very different office cultures, making it hard for any user to predict how to interact optimally with other users.

So, how to create success? With the technological product itself being close to flawless it can be removed from the equation, which leaves us with skill, physical environment and culture. Skills can be taught, the very variable skill level displayed by users indicate that training should be mandatory to ensure a fairly high level as the common minimum. Physical environment can be built, which Statoil is in some locations in the process of doing, providing workers with an environment that enables efficient communication yet does not make large sacrifices in other areas. Culture grows from a balanced input of stick and carrot, creating a work environment where the individual is given as much freedom as possible without creating excessive negative impact on his surroundings.

This answers the final research question.

8.2 Limitations

While the qualitative method is good for gaining in-depth understanding of a new and mostly unfamiliar concept, it also has its limitations. With the amount of work involved in analysing each interview the total number of informants that can be used for a given amount of work is necessarily lower than in a quantitative study where the analysis can benefit from economies of scale.

While I do not consider the number of informants to have been too low, the way they were recruited was not good enough. The study should have had representatives from all major educational fields represented in Statoil and should have included at least some users who were having problems using Communicator. Instead my selection consisted solely of engineers, natural scientists and IT-professionals, all of whom can be considered to possess general IT-skills above average even for a high-technology energy company. With my selection also being predominantly volunteers there is a high risk that I even when comparing to the total population of engineers, natural scientists and IT-professionals in the company received informants who care more and know more than even that skewed population about the Unified Communication project and the Office Communicator system.

While looking directly for those that have the most problems with Office Communicator would not have been easy, especially considering how these users may be less likely to volunteer for research on a system they may feel uncomfortable with, getting a better insight into the problems could have been achieved by going to those who actually work to solve these problems; the IT-support service. The Unified Communication project team is aware that not all problems are registered and so the IT-support service does not have truly representative data on the distribution of problems, but I have no doubt that they nevertheless have more and superior information about the problems than what I was able to gain through interviewing project team members, other IT-professionals and my selection of unusually competent and satisfied volunteers.

The selection of informants I had was suitable to study the impact of Unified Communication on individuals in different environments. An alternative would that would also have been valuable would have to have a connected set of informants that are at different levels of the hierarchy in a single department/business unit, in order to get an idea of the impact of Unified Communication on the various levels of an organization.

8.3 Implications

This project looked at the impact on end-users of the Unified Communication suite from Microsoft. From this there are two main directions to expand:

1. Perform a study on end-users in a company where a similar system from another manufacturer is used, and/or where the environment is different.
2. Look at how Unified Communication impacts other aspects of organizations. Studying organizational effects instead of the usage by individuals has been mentioned, another important aspect is that of economy.

Taking the latter direction first: Apart from the reduction in travel cost, Statoil expected

communication to get better, yet not cheaper through this project. Is it possible to also achieve cheaper communication through Unified Communication? What sacrifices must be made to accomplish this?

Also, can organizational hierarchies change as a result of Unified Communication? Could it for example change the number of employees that can be effectively supervised by each manager? How is collaboration with other organizations affected by connecting multiple channels of direct communication between subordinate employees in each organization?

If studying implementations where the system and/or environment differs from that of this project, are the challenges much the same and thus related to the concept of Unified Communication itself, or are they primarily related to the specific product or environment the company operates in? In case of failure, what went wrong and what was right? What are the critical success factors of Unified Communication, and how do they compare to the critical success factors of other enterprise systems?

Finally, how is Unified Communication used when it is no longer new and exciting, but instead established and expected, even required to be taken seriously? If videoconferencing becomes available to everyone on every device at negligible cost, will we see a race for maximum richness in every communication session and the end of traditional audio telephony? Will it affect the number of workers that work from home?

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Appendix 1 – Interview Guide

A. Information about the respondent

1. Age:
2. Educational background:
3. Years at Statoil:
4. Department/unit at Statoil:
5. How would you describe your own level of IT competence?
6. Would you say IT is something you are personally interested in?

B. The introduction and background for Office Communicator/Unified Communication

1. What was your initial reaction to using the new system?
2. Did you have prior experience with other applications offering similar functionality, such as Yahoo Messenger or MSN/Live Messenger?
3. If so, did you notice any particular differences going to Communicator, positive or negative?
4. Did you go to the introduction class before using Communicator for the first time?
5. If so, did you consider the introduction class sufficient/insufficient/excessive?
6. Were you told the motivation for implementing Communicator at Statoil? If so, can you recall any points of the motivation that felt particularly relevant or irrelevant to your work situation at the time?

C. Using Communicator

1. Do you consider Communicator an important tool for getting your daily work done?
2. Has Communicator replaced other applications or non-pc technologies partially/fully?
3. Any other changes to your work day as a result of getting Communicator?
4. What/who have been the main motivators for you to use Communicator?
5. If you have required assistance with Communicator, who have you gone to?
6. Do you use information available through the Communicator interface (online status, phone numbers, notes etc) for purposes other than contacting people through Communicator? (Example: checking Communicator status to see if someone can likely be found at their desk, looking up phone numbers that are then dialed outside the Communicator system)
7. Do you consider Communicator a more/less stressful way to communicate than email, phone, face to face meetings etc?

8. Do you consider Communicator more/less appropriate than email, phone, face to face meetings etc for making initial contact with an unknown colleague?
9. Do you sometimes set your Communicator status to «busy»/«do not disturb» even though you are available, to get a break from messages?
10. If you log on to Communicator from home, do you frequently use it? Do you feel pressure from others to use it?
11. Can you explain briefly what factors are involved when you decide on which type of communication (Communicator messages/phone/email/face to face/other) to use when you take the initiative to communicate?