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REAL TIME COMMUNICATION – MODES OF USE IN DISTRIBUTED TEAMS

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Abstract

Skype™ has become a prominent and successful example of a new genre of computer-mediated communication environments called Real Time Communication (RTC). A limited set of integrated features enable instantaneous text, voice and video communication across the globe for free. However, an analysis of the features or affordances of the technology does not reveal the wealth and creativity of forms and modes of using Skype™. Hence we have collected five case vignettes to illustrate how Skype™ has been embedded into the daily routines of distributed teams. From a theoretical lens, this comparative study shows how general purpose technology can only be properly understood in context because users shape the forms of usage to a large extent through processes of appropriation. The study also provides insights into processes of technology appropriation and the various roles and appearances of presence in virtual work settings.

Keywords: Real Time Communication, technology affordances, appropriation, technology-in-use, presence and awareness, distributed teams, virtual teams.

1 INTRODUCTION

In recent years we have observed a profound transformation of the organisation and practices of work: most prevalent is the increase of distributed and networked forms of work within and across organisations (Ciborra & Suetens, 1996; Malhotra et al., 2001; Orlikowski, 2002). The distribution of work has extended degrees of freedom in terms of place and time of work – virtual work has significantly increased over the past years – while maintaining a high level of connectedness (Kakahara & Sørensen, 2003). In parallel, the availability, bandwidth, richness and diversity of communication technologies and services has increased remarkably enabling or even driving new virtualised work arrangements. The proliferation of new communication technologies has led to a situation, where instantaneous text, voice and video communication across the globe are available for free for those who have Internet access.

While technological affordances of computer mediated communication environments are emerging at a fast pace, their potential impact is not well understood nor do we have a well founded knowledge about how distributed teams use these technologies and how they can use it productively. While only few studies on the use of Instant Messaging in the workplace (e.g. Nardi et al., 2000; Cameron & Webster, 2005; Isaacs et al., 2002; Herbsleb et al., 2002) are available, we are not aware that the business use of Real Time Communication (RTC) technologies, which typically support both Instant Messaging and VoIP, has been studied. In order to develop a better understanding of the use and impact of these new communication technologies, we have studied the use of Skype™ across a range of distributed teams documented in five case vignettes.

RTC technologies have become part of the corporate communication and collaboration infrastructure, which enables diverse forms of use. Generally, the diffusion, impact and patterns of use of infrastructure technologies are hard to predict. The study of technology features (espoused technology) reveals little of potential impact or social and organizational forms of appropriation. Hence our focus is on the life world, i.e. the social and organizational settings in which technology use is embedded. We present five case vignettes which provide insights into processes of appropriation, life-world adaptations and diverse forms of usage of Skype™ in a range of distributed work contexts. The examples illustrate how organisational needs, the relationships of the users, as well as group structure, culture, and management styles shape the technology-in-use.

We begin by introducing Skype™ as example of an ongoing market trend towards Real Time Communication; we then clarify our theoretical position. Section 3 describes the cases, while section 4 presents a brief analysis and discussion of our findings.

2 NEW MEANS OF COMMUNICATION

2.1 Trends and developments in the market for communication applications

The communication landscape is changing. Instant Messaging, IP telephony and videoconferencing are spreading quickly and have made fast inroads into the corporate domain (Lazar, 2006). Technology to support distributed teams (e-Collaboration) draws a lot of attention from developers and users likewise (Bradbury, 2005; Lazar, 2006).

Instant Messaging is reported to be among the fastest growing communications media of all times (Meall, 2006). While spam and an almost uncontrolled flood of messages indicate shortcomings of e-mail, Instant Messaging is seen as an alternative that allows for immediate and more controlled communication (Conlin, 2005). However, many companies still have mixed feelings about the new technology. While the use of Instant Messaging in the workplace creates security fears (Hollis, 2004; Morissey, 2005; Gaskin & Thayer, 2005), raises legal questions in regards to logging liabilities

(Gawlicki, 2005), and is seen by its opponents as a potential waste of time (Meall, 2006), Instant Messaging tools have quickly spread throughout many organisations (Bradbury, 2005). Much like Instant Messaging, telephony over IP networks (VoIP) has entered many organisations either propagated as low-cost telephony solution or – in absence of a clear policy – through the back door with tools such as Skype™ which employees simply download and install on their computers (Cheung et al., 2005; Mitchell, 2006).

2.2 Skype™ – Overview and features

While Skype™ has been around since 2003 and is very successful in terms of user numbers, not only for private use but also in terms of corporate usage, it was rarely mentioned in articles on Instant Messaging (Gawlicki, 2005; Bradbury, 2005). Only recently it attracted extensive public attention, when the company was bought by Internet auction provider eBay. While there is controversy as to whether Skype™ is ready for business use (Gaskin & Thayer, 2005), Skype™ Group claims that one third of their over 100 million customers have used Skype™ for work-related purposes. Recent estimates expect over one million corporate users who will rely on Skype™ as their primary means of communication by 2007 (Woolley, 2006).

The core element of Skype™ is the buddy list, which is well-known from other Instant Messaging clients. Users generate this list by sharing their user ID with other users. Access to a user is typically limited to the (authorised) members of the contact list, which de facto creates a closed community (Mitchell, 2006). The buddy list shows an availability status icon for every contact.

Skype™ offers person-to-person text chat functionality as well as group chats, i.e. text based multi person conferences. It also archives text conversations, which is important for many companies from a compliance point of view (Gaskin & Thayer, 2005). The message history is available to all conference participants even after ending a chat session, which helps keeping track of conversations (Economist, 2006). Furthermore, text conversations can be bookmarked in order to facilitate ongoing group conversations, i.e. persistent chat channels.

The VoIP calling functionality is typically promoted as Skype™'s primary value proposition. Users can place free voice or video calls to other Skype™ users who are currently online. Users can also setup conference calls with up to four people (conference calls are limited to voice calls; video is only supported for bilateral conversations in Version 2.5, September 2006). Moreover, Skype™ also allows its customers to place calls to (SkypeOut) and to be called from (SkypeIn) traditional landline and mobile telephones. These features are not free of charge and require the customer to setup an account with Skype™. In most countries Skype™ is reportedly the cheapest VoIP provider in the marketplace (Fitchard, 2004). Further VoIP features are voice box functionality, the ability to send short messages to mobile phones (SMS), and a call forwarding feature that allows users to forward unanswered calls to a designated landline or mobile phone. Although Skype™ cannot fully replace traditional phones since features such as emergency calls are not supported, it acts almost like a full VoIP provide.

Skype™ offers basic capabilities for customisation. A personal profile can be set-up with information visible to the entries in the personal buddy list. A photo, postal address, E-Mail address, phone numbers, date of birth, a personal homepage, and a short personal message that is visualised as a speech-bubble can be entered. Moreover, the user can configure the tool appearance in terms of sounds, ring tones, hotkeys, language, and by hiding some features. While the options for tool customisation are quite limited, the buddy list is a powerful instrument for customising the communication environment.

On a technical level, Skype™ is based on a peer-to-peer architecture. It uses a proprietary protocol which is known to be very effective in circumventing firewall mechanisms by using multiple ports or masking as Web traffic (Mitchell, 2006). Hence, the tool is able to connect to its network from almost any environment. Communication traffic is also automatically encrypted (Gaskin & Thayer, 2005).

To sum up, Skype™ offers real-time communication by integrating voice and video capabilities with Instant Messaging within a controlled environment defined by the buddy list (Lazar, 2006; Mitchell,

2006). The description of its features illustrates that Skype™ is a rather simple communication tool compared to other groupware applications (e.g. Lotus Notes). In essence, it facilitates synchronous computer-mediated communication complementary to products such as Microsoft Outlook. However, the technical features provide little insight into the emerging forms of use and indeed its potential to facilitate distributed work.

2.3 Appropriation of general purpose technologies

Following Orlikowski's distinction between technologies as bundles of features (artefacts) and technologies-in-use (Orlikowski, 2000), we argue that perceiving Skype™ as an artefact would limit our understanding of its novelty, versatility and potential impact. According to Orlikowski and Hofman, general purpose technologies do not aim at automating a predefined sequence of operations or transactions, but are used in different ways across various organizational activities and contexts (Orlikowski & Hofman, 1997). As a general purpose technology, Skype™ can only be properly understood in context because the users shape the forms of usage to a large extent through processes of *appropriation*, i.e. shaping and embedding of technologies into practices, and *enactment in situ* (Orlikowski & Iacono, 2000).

Perceiving technology as enacted by its users directs researchers' attention to stretching the technology-in-use, i.e. the ways different people use technology in particular times and places, rather than only making the artefact the subject of the discussion (Orlikowski & Iacono, 2000). Doing so also brings unintended consequences to the fore, i.e. the use of technology and its implications in organisational settings, which are not envisioned or intended by its designers and implementers. By routinely engaging with particular technologies in particular ways, people enact and re-enact a set of rules and resources (i.e. technology structure) which structure their interaction with that technology (Orlikowski, 2000). Consequently, a recursive relationship exists between the technology structure, which shapes their use, and the users who while drawing upon the technology in their routine practices produce and reproduce the technology structure. This technology structure is routinely enacted as people use specific machines, devices, etc. in their everyday situated activities.

Thus, while technology is constructed by developers having specific assumptions and visions about the artefact in mind, it can be said that only technologies-in-use structure users' engagement with the world as users deliberately or unintentionally enact it in particular ways (Orlikowski, 2000). That is, within their social practices users may heavily draw upon some specific features from a set of technical properties proffered by an application while neglecting others. The enactment of technologies-in-use is not done by isolated users. Rather the broader organisational context or institutional setting needs to be taken into account with its protocols, norms, assumptions, and knowledge. Considering broader institutional aspects also helps to explain the fact that people in similar communities are often likely to enact technology in similar ways.

3 SKYPE-IN-USE

Starting from the IT artefact, our case analysis will show that work groups exhibit quite different practices in which different features of Skype™ have been appropriated and embedded. Across the cases we are able to sketch out recurring themes.

3.1 Secure attachment in a distributed research team

Skype™ is used in the collaboration of two research teams, which are located at different universities (A and B) in two European countries and are both members of a large EU project consortium. The project manager Karl, who is also PhD thesis supervisor to a number of team members at both locations, had recently moved from university A to university B and visits university A only 4-6 times per year. In terms of virtual organising, the members of the two research teams are involved in multiple

research projects in different constellations: some of the projects are joint projects between universities A and B, some take place only in one location. Membership in the different project group varies.

After Karl had left university A, the morale in the research group had deteriorated, even though a regular flow of email exchanges and occasional phone conversations was maintained. However, the atmosphere changed considerably after Skype™ was introduced in both research teams. The Skype™ status flag made Karl visible and approachable, whenever and wherever he was online. Little routines about signalling and “outeraction”, i.e. short messages to negotiate availability for VoIP calls or conferences calls, were developed (cp. Nardi et al., 2000). Text chats, as well as text and voice conference calls were initiated spontaneously whenever needed. The already high volume of communication events increased even further and added to the fragmentation of Karl’s daily routines. However, the perception of connectedness, the improved morale and productivity of the teamwork as well as the ability to quickly address and solve issues more than compensated the negative impact. The frequent verbal exchanges facilitated a regular sharing and “synchronizing” of contextual information, which had not happened in the email exchanges. This new practice kept Karl and the team members in the loop (for a related analysis see Fröbner, 2006).

The sharing of contextual information via the Skype™ availability status was reported to be the most important feature for the group, especially from the point of view of the PhD students located at university A. Skype™ provided Karl with a communication channel to signal his availability and to sense the online presence of his team members. The mutual perception of presence allowed the team members to explore and look for solutions themselves, while being able to request assistance whenever needed. This form of virtual presence facilitated what development psychologist call secure attachment (Holmes, 2001). Being able to respond quickly and provide support when needed allowed the project manager to usually remain in the background and still create a sense of security among the team members; this bolstered the confidence of the team members. In addition, the occasional short text messages and the possibility to upgrade to a richer channel to discuss more complex issues provided a rich environment for productive collaboration even where tacit knowledge was involved and knowledge integration across times was needed.

3.2 Team coordination

Martin is a professor at a European University working with a small team of researchers on various projects. Martin has several roles in regards to his team; he is PhD supervisor for some of the team members and at the same time coordinates tasks in his team related to projects as well as the general business of running the work group and the teaching environment. His team is located at the University campus but locally distributed across several sites and team members occasionally work from home. Hence, practices of telework did emerge in which Skype™ plays a significant role.

While Skype™ is also occasionally used to communicate using the text chat and VoIP functionality, Skype™ is mainly used for coordination purposes and the creation of awareness. The availability status in Skype™ indicates whether a person is currently online and thus potentially available for communication. However, this information was found to be not semantically rich enough since it does not say anything about the actual availability for communication, e.g. the urgency of a task someone is working on and whether an interruption would be possible at a particular time. Hence, team members now use the speech-bubble feature in their personal profile to provide semantically richer information about their location (i.e. @home, @uni), their current tasks (i.e. writing on my thesis, writing a research report), and additional information such as the need for support (“I am alone in setting up a conference room”). Martin as the team coordinator has set the rule that this information is to be held up to date so that he can monitor ongoing work and the status of tasks.

In addition to facilitate monitoring, the semantically rich signalling also provides the basis for “permission based conferencing”, whereby the team members use the speech-bubble to signal current location and task which implies availability for communication. Hence, while the descriptions provide more transparency about the team members’ actual work, they are also meant to reduce or even avoid

interruptions or disturbance when being engaged in an important task. The example shows how Skype™ is being used to create a form of awareness that goes beyond the mere signalling using the availability status. However, the problem in Skype™ is that this kind of semantically rich, contextual information typically would require a differentiation of addressees of the messages, which Skype™ does currently not provide. Currently all Skype™ contacts can see the messages of an individual team member, even though they are primarily intended for Martin as the team coordinator.

3.3 Software development in a virtual organisation

Snowpatrol, founded in 2005, is a Swiss-based internet start-up aiming at developing a new online platform. Because of the fierce competition within the Swiss market, management decided to reduce the time to market and launch the platform as early as possible. The pilot was scheduled to be built within the first three months after the initial business plan was accepted and the development of the platform itself would start immediately afterwards. Recruiting the right people was perceived as a crucial success factor for the whole project. Rather than hiring all the required people, an alternative strategy was chosen with the formation of a virtual organisation, consisting of five external enterprises plus Snowpatrol with its eight employees. Enabled by the fact that all partner organisations were located in a range of 100km around Snowpatrol's office, on-site team meetings were held every Thursday and Friday. The partner organisations were obliged to attend at least one of them. Being aware of the important role of social capital and a shared passion for the success of the project, management argued that these office days, first, helped to develop a shared understanding of the project as ambiguities were discussed and medium-range targets set, and, second, gave employees an opportunity to socialize and to build relationships (cp. Riemer & Klein, 2003).

However, for their day-to-day work, software developers unanimously confirmed the paramount importance of Skype™. While they also made occasional use of the VoIP functionality offered by Skype™, it was rather the chat feature that had a strong impact on how work was organized within Snowpatrol and across the whole virtual organisation. More specifically, the software developers started to use the chat function in a quite innovative way, which many of them did not know before. Chat channels were set up for different topics, such as 'Broadcast Development' or 'Trash and Talk', to which further employees of Snowpatrol and the partner organisations were invited over time. As Skype™ allows bookmarking these channels, they became institutionalized over time and highly frequented by almost all employees. Within the virtual organisation, the channels played the role of keeping everybody updated on topics and events that were of general interest. Within the 'Broadcast Development' channel, for example, developers proactively announced when servers needed to be shut down or applications needed to be updated so that everybody was aware of the ongoing activities and the implications they might have on their own work. However, besides these institutionalized channels, ad-hoc chats were created for more work specific topics. The ad-hoc channels had a more limited number of participants and a shorter lifespan. For instance, if problems occurred during the development of a certain piece of code, one of the affected developers would create a text chat and invite the others to discuss the topic. If required, further experts or the management were invited to either attain alternative perspectives or inform the management on important decisions that needed to be made. To sum up, both the institutionalized channels and ad-hoc text chats helped to create a communication infrastructure which proved to be crucial for the way work was organized between the dispersed team members. Awareness of task-related events was created and fast and focused discussions for trouble shooting became part of software developers' work practices.

3.4 An open virtual office

Sunrise is a small, four year old software development company headquartered in Dublin. Its founder and the three other employees, who are all in their thirties, develop specialized software applications for large international companies. Due to the size of Sunrise and the long established working relationships among its members, the organisational culture is very casual but at the same time highly profes-

sional. All members perceive themselves as pioneers within their area who frequently experiment with new hardware or software devices which could either be used for their own work or might open up new product opportunities.

In 2004, a turning point occurred when Declan, the founder of Sunrise, announced he would get an apartment in Barcelona and spend half the year in Spain, mainly because of the better weather conditions and life style. To adjust to the changing organisational structure, the team decided to use Skype™ to link the Dublin office with the Barcelona office. The computers of all team members were equipped with microphones and loudspeakers instead of headsets. While over the first few months the team members experienced no organisational problems, Declan started to feel isolated in Barcelona and cut off from the rest of the team, exacerbated by the fact that he had in the beginning no friends in Barcelona. While their former communications via Skype™ were generally quite subject-driven with talks being terminated after the main purpose was achieved, communication patterns changed significantly over time. After one discussion about some code, Declan did not hang up and neither did his colleagues in Dublin. While this seemed to be a bit strange in the beginning, as they could hear each other breathing as each of them worked intensively on the code without saying anything, both sides agreed to letting the channel open all day. By doing so, a shared audio context was created for the two offices which did not only ease Declan's feeling of being isolated under the Spanish sun, but it also affected the way work was organized. Rather than having to initiate communication events, team members could address each other, ask questions and start discussions as if they were all at the same location. Furthermore, as Declan eavesdropped on all the discussions in the Dublin office, he was constantly aware of the working status, problems and social activities. On the other hand, the team members in Dublin were released from constantly updating Declan on ongoing events and decisions.

3.5 A travel companion

Jack is the CEO of German IT provider Javatown. With 30 employees Javatown is a small company that was founded as spin-off of fashion retail company Smash. Today, Javatown is still located in Smash's main building and manages its mostly IBM-based IT environment. In both companies, Lotus Sametime® has been available to all employees for the last five years. Instant Messaging is extensively used to coordinate work-related issues like meetings and to improve informal communication. Hence, Instant Messaging has become an integral part of Jack's communications portfolio. Since Lotus Sametime® is restricted to internal usage Jack also uses Skype™ in order to stay in contact with some of his external partners.

However, Skype™ plays the most important role when Jack is travelling. Besides his external contacts, Jack's Skype™ buddy list also contains the 15 most important people within Javatown and Smash. When travelling across Europe or the U.S. Jack uses public wireless networks or mobile dial up to connect to the Internet. Since Skype™ is very effective in connecting to its network under a large variety of network conditions, it is for Jack a reliable way of staying in contact with his social network at work. At the same time the Skype™ buddy list serves as a prioritisation mechanism in that only the most important people have access to Jack while he is travelling and thus under time pressure.

Besides using the Instant Messaging capability for quick coordination or information gathering with people in his organisation, Jack also uses Skype™ to place voice calls. These can be either voice calls to people in his buddy list or SkypeOut calls. By using SkypeOut, Jack is able to place phone calls to customers and partners in Germany from anywhere he can get Internet access at a very low price. It becomes obvious that for Jack Skype™ is a travel companion or mobile communications gateway that allows him to stay connected from wherever he is and allows selected people in his organisation to get in contact with him when they see him log on to the network. People thus do not have to try and reach him on his phone when he might not be available. Knowing that Jack will go online frequently they can wait for Jack to make himself available for communication. At the same time this allows Jack to manage his communication more effectively.

4 CASE ANALYSIS

The case vignettes show a huge variety of Skype™ usage and appropriation. Diverse practices can be identified with different Skype™ features at the centre of the respective work practices. In all cases, new practices have emerged in which Skype™ has become embedded. At the same time, however, these practices cannot be fully understood by only looking at Skype™ and its usage. Rather one has to shift the perspective from a technology or feature view to a practice view that treats Skype™ as technology-in-use in order to understand collaborative processes, the usage of Skype™ and its impact in the group context.

Our observations can be described in terms of computer-mediated group processes of communication, coordination, and cooperation, whereby Skype™ enables new and amends existing collaborative practices. Skype™ appears as an enabler and infrastructure underneath new collaborative practices. From our case comparison two main aspects emerged that illustrate the diverse ways of Skype™ appropriation in context: the ways in which Skype™ is adapted to produce awareness in the distributed work contexts and the reproduction of existing management styles through different forms of Skype™ use. Before we will turn to these aspects, we give a brief analysis of the different types of Skype™ usage in the cases; table 1 gives an overview of the complete case analysis.

4.1 Appropriating Skype™

In every case one or two core themes can be identified which characterise the usage of Skype™ and shape the emerging computer-mediated practices. At the same time, the resulting benefits for the users and their groups are quite diverse. In the *first* case, Skype™ is at the core of a practice of flexible distributed collaboration that nonetheless delivers a sense of secure attachment from the PhD students' point of view. The status information creates a context of social awareness on which the team members can draw whenever they need to communicate to the supervisor. In the *second* case, the speech-bubbles are appropriated in a way that reproduces and extends practices of task coordination and control. For Martin, Skype™ acts as a coordination dashboard that creates awareness of ongoing activities. Topical information about location and tasks allows minimizing unintended and counterproductive interruptions of team members. In case *three*, Skype™ is appropriated as part of task-focused practices of coordination and collaboration. Text chat and chat channels are used to collaborate on shared software development tasks and to broadcast task-related status and progress information in order to foster the coordination of distributed work. In the *fourth* case, the free VoIP call functionality enables the creation of a shared virtual (audio) space that creates a sensation of virtual co-presence for the distributed team members. In case *five*, Skype™ is used as a mobile communication tool. The buddy list is a way of controlling, prioritising, and channelling communication events in the restricted time slots during international travel. A practice emerged whereby team members wait for Jack to log on to Skype™ in order to get in contact. SkypeOut and the low cost of placing calls also enable efficient telephone communication.

The different ways in which Skype™ enables work practices and creates benefits for the actors in the five cases underline our argument that general purpose technologies (such as communication infrastructures and tools) can only be understood in context. A technology-in-use perspective sensitizes the observer for processes of appropriation and embedding into ongoing and emerging practices.

4.2 Presence, signalling and awareness

Real-time communication emphasizes the advantages of synchronous communication; it allows overcoming distance and yet maintaining an (extended) sense of presence in and awareness of remote locations. RTC provides a computer-mediated communication environment, which enables or is appropriated to facilitate a virtual social space, which permeates the physical world. The actors in our cases all work in physical environments which are extended to include colleagues in remote locations. The re-

remote colleagues and part of their working environment (location, tasks, noises etc.) become part of a hybrid, i.e. combined physical and computer mediated, environment.

This environment allows individuals to extend their presence to remote locations; they can make themselves heard within an observable context. Presence is enacted in different ways and modes, e.g. by signalling availability and being available when needed, share information, engage in a dialogue to listen, counsel, coordinate or decide. Beyond the range of active communication acts, the computer mediated environment facilitates a sense of awareness: who is online, what is their status, what information is shared? This awareness can be latent, almost like noticing the light or noises coming from a colleague's office in passing, or more conscious in the sense of paying attention and active monitoring. Awareness in this sense is not a feature of the technology, but the result of shared practices in which the technology becomes embedded.

Both aspects, extending individual's presence and broadening attention and a sense of awareness, are illustrated in the various practices in our cases:

- In case *one* availability information signals presence as potentiality, which can be drawn upon in case of need for communication; moreover it creates a context of social awareness ("canvas of awareness").
- In case *two* signalling of location and tasks of team members allows for optimized team deployment and also more effective and less interruptive communication. Awareness is task-related.
- In case *three* continuous documentation of ongoing work creates a common information sphere and provides awareness of ongoing events for coordination of work (task-related). The sense of co-presence facilitates intra-team coordination and has become part of the culture of this virtual organization. Indeed it is crucial for the production and reproduction of work practices and the organisational culture between Snowpatrol and its partner organisations.
- In case *four* the open audio channel facilitates a virtual open office. This extends the sense of virtual presence and awareness for the *Befindlichkeit*, i.e. a broad, holistic emotional state of team members, work rhythms etc. Latent awareness creates a common context, which enriches purposeful and directed communication.
- In case *five*, signalling availability is a way of making oneself available for communication in an otherwise precarious situation (en route with time constraints). Team members experience awareness for Jack's travel rhythm and can plan their communication events around the time slots when he makes himself available.

These practices are cooperative in character in that they intend to align people's interdependent activities (Schmidt, 2002). The observable differences reflect different managerial cultures (more laissez faire in case *one*, more actively coordinating in case *two*), different task structures and different levels of semantics in what is shared: the status flags and open audio channel on the one side, clearly defined protocols of documenting status information (case *two*) or ongoing development work and related issues in case *three*.

4.3 Reproduction of organisational structures and management styles

The different communication arrangements reflect the organizational structure and the rhythm of work. Cases *one*, *two*, *four* and *five* can be described as focal networks, in which one person has a key role. Many of the communication practices are focused on the needs of the relations between team members and the manager. In contrast, case *three* illustrates practices which are more driven by the intra-team coordination. Ongoing development work does not only require space for dialogue and discussion but also for an ongoing documentation (reification) of open issues and outcomes. Hence, coordination is more content than person-based.

Task structure and rhythm of work also reflect the varying levels of interdependencies among the team members and across locations. In case *one*, the major part of intra-team coordination happens locally. Mutual visits have formed the basis of a growing component of – Skype™ enabled – collaboration across locations. In contrast case *three* functions as a virtual organisation with distributed, highly interdependent development tasks across locations. This requires not only practices of inter-personal coordination but also task-related documentation of information.

	Case 1	Case 2	Case 3	Case 4	Case 5
Focal Skype™ features	Availability status	Speech-bubbles	Chat channels Text chat	Ongoing conference call	Buddy list, SkypeOut
Technology-in-use	Availability information provides sense of secure attachment and facilitates communication on-demand	Current task status allows for effective team coordination and reduces unintended interruptions.	Coordination of work on distributed tasks enabled by various text chat channels, which provide a common information space	Open audio channel creates persistent virtual communication environment and lessens feeling of physical separation	Buddy list allows control of communication partners and prioritized communication; SkypeOut offers low-cost long distance calls.
Presence & awareness	Extended presence through increase synchronous communication and signalling of availability. Mutual awareness of team members.	Extended presence through highly contextualized coordination. Extended awareness through differentiated signalling.	Extended awareness of ongoing work through the creation of a common information sphere. Managerial attention supported by a continuous flow of topical and detailed information.	Mutual sense of awareness increased by open audio channel. In essence a virtual open office has been created.	Presence is focused through signalling of availability and synchronous communication in a mobile environment (en route).
Organisational structures and managerial practices	Flexible and largely self-organising work groups, with loose coordination, intervention and support from the background.	Active multi-project management and coordination with elements of control.	Virtual organisation with high levels of independence and accountability. Management sets context and basic rules and carefully monitors ongoing progress.	Open work environment facilitates classical management practices comparable to a collocated work setting.	Creation of stability and security in an otherwise flexible organisational (i.e. mobile) structure. Similar to case 1 with particular emphasis on mobile manager.
Main benefit	Secure attachment.	Real time coordination dashboard.	Collaboration & common information space.	Virtual open office environment with sense of social presence.	Efficient mobile communication and coordination.

Table 1: Overview of case analysis

As much as Skype™ is integrated in people’s work practices, it has also an immediate influence on managerial practices. In order to illustrate versatile ways of enacting Skype™ and its implications on managerial practices, we compare and contrast two cases with structural similarities: vignettes *one* and *two*, which both describe the use of Skype™ within an academic setting (see table 1 for short interpretations of the other cases). In case *one*, flexible organisational structures prevailed with Karl and his team members working on several projects at different locations. While the work was characterized by high independence and self-organisation, team members occasionally depended upon Karl’s rich experience and advice. Thus, while Karl and his team members sustained a flexible and independent way of working, the integration of Skype™ brought about a shift of the quality of interaction as team members could contact Karl on demand. By addressing team members’ need for feedback, Skype™ enabled to maintain a consultation-based management style and flexible organisation within a virtual setting. In contrast, case *two* illustrates how Skype™ can also be used in organisational structures with more active interventions and control. Although most team members were co-located and would regularly meet, project-related travel and telework constituted a distributed work environment. Martin introduced communication norms for Skype™ asking team members to constantly update their current whereabouts and activities. By doing so, Skype™ not only created an increased transparency and un-

derstanding of each other's task context, moreover it allowed to enact already established managerial practices of coordination and control. The use of speech-bubbles to provide topical task and location information was certainly not envisaged by the Skype™ developers. Heightened transparency allowed Martin to coordinate and efficiently assign tasks depending on resource availability of team members. At the same time it provided a facility to continuously monitor ongoing work and still signal the need to work uninterrupted. The detailed awareness of the task status allowed team members to restrict communication.

As the vignettes show, classical management models are eroding, making way for a variety of different approaches that go beyond a 'pure' hierarchical model. Managerial practices are less clearly delimited and institutionally determined; they are context-dependent, open to reinterpretation and adaptation. Classic frontiers of organisational roles and functions become increasingly blurred and forms of management practices tend to exist somewhere along extreme poles, such as stability/flexibility or security/accountability (Kratzer et al., 2004). Hierarchies are replaced by more flexible forms of organising and accountability and control are delegated from the management to organisational groups or teams. However, this is not to say that new organisational forms will shift towards the other extreme (e.g. complete flexibility and accountability), rather the needs of organisations and employees are likely to bring about different shapes of managerial practices between those extremes.

Table 1 summarizes the cross case analysis.

5 CONCLUSIONS

For millions of users, Skype™ has become a core element of their computer-mediated communication environment. It provides a relatively simple, integrated set of functions for synchronous communication and can thus be characterised as general purpose technology or part of the users' communication infrastructure. As such, the scope of its usage is not determined by the set of features provided. Rather, its forms of use and its impact depend on the appropriations of the technology. While the technology design and its feature sets shape and constrain the users' choices, the context and practices of use, these very practices in turn shape the technology-in-use and to a large extent determine its impact (Markus, 2005). Compared to other collaborative technologies, which have been characterized as highly tailorable (Orlikowski, 2000), Skype™ is not a highly customisable tool (Markus, 2005). And yet, Skype™ shows to be interpretively flexible, i.e. flexibility in terms of how people interpret and use the technology (Orlikowski, 1992).

Five cases of Skype™-in-use illustrate the amount of interpretive and indeed design flexibility. They illustrate creative practices which have emerged based on Skype™ or into which Skype™ has been embedded. We have tried to explain the role of Skype™ in terms of overcoming constraints of time and space and elaborated on the notions of presence, availability and awareness. The cases provided rich evidence of complex patterns of interpreting, adopting, appropriating, embedding and enacting of technology, which have been shaped by organisational structures, management cultures and social practices. In turn these practices are increasingly shaped by the technology. More work in context is needed to extend our understanding of emerging practices of distributed collaboration in computer-mediated communication environments.

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