# Changing the Communication Culture of Distributed Teams in a World Where Communication is Neither Perfect nor Complete

**Peter Weimann[1], Christian Hinz[1], Elsje Scott[2] and Michael Pollock[2]**
**[1]Beuth-Hochschule, Berlin, Germany**
**[2]University of Cape Town, South Africa**
weimann@beuth-hochschule.de
christian.hinz81@googlemail.com
elsje.scott@uct.ac.za
michael.pollock@uct.ac.za

**Abstract:** Distributed teams have been set up to work together across space, time and even organisational boundaries over the last few years, to increase the availability of scarce skills, reduce travel costs, and increase worker job satisfaction through fewer relocations. This has been due to globalisation, shorter development cycles and scarce human expert resources placing additional pressure onto project teams. Technological developments, such as various communication technologies, have helped to support this move to distributed teams. These communication technologies, including phone and video conferencing, mobile technologies and the Internet, help team members handle project tasks in a distributed or virtual team project environment. This case study based paper provides an analysis of the communication culture and tools of the distributed teams of a large German manufacturer. The communication behaviours and tools used by these real distributed teams working together in different settings on international projects are analysed. The advantages and disadvantages of the distributed work setting and the different technologies used by the teams were gathered via a questionnaire and interviews with the leader and members of the different teams. The findings show that regular face-to-face meetings, email and phone still play a pivotal role in team communications, even though a variety of communication tools is available. The results also indicate that, like non-distributed teams, a need for common ground and shared meaning, or social context, are essential elements for the communications within a distributed team. Face-to-face meetings are still important to create a common ground and shared meaning in distributed teams. The complexity of the tasks needed to be performed by the distributed team is also affected by this social context. Team members often complain about misuse of the different tools, as well as a lack of communication rules regarding the different communication tools. The case study shows that team member satisfaction and team success can only be accomplished if the communication culture in the company takes into account the technologies used and the distributed work setting.

**Keywords:** communication culture, virtual teams, communication technology, communication pattern, change management

## 1. Introduction

Globalisation, shorter development cycles and scarce human expert resources all contribute to the additional pressure placed on project teams. As a result, distributed teams are formed to work together across space, time and even organisational boundaries to increase the availability of scarce skills, reduce travel costs, and increase worker job satisfaction (due to fewer relocations). This is possible due to different technological developments that support the work of distributed teams. These developments comprise tools in the categories of groupware, video conferencing, mobile technologies and the Internet.

These technologies and tools are necessary for virtual teams to carry out projects (Lipnack & Stamps 1997). These projects are performed in a virtual environment as organisational boundaries are crossed and teams are distributed across time and space. This virtual environment, although mitigating some risks and costs, gives rise to additional risks to the success of a project. Thus project management of virtual teams is different to that of traditional teams. The traditional risks of projects such as their complexity, the uncertainty of factors influencing the projects and the high interdependency of the project tasks to be managed, together with the temporal, geographical and cultural dimensions of virtual teams, make the management of a virtual project a risky and complex undertaking with a high probability of failure.

In addition, it is a well-known fact that even under normal circumstances it can be extremely difficult to manage the incompleteness of our communication (Cockburn, 2006). De Pillis and Furumo (2007)


Reference this paper as:
Weimann, P, Hinz, C, Scott, E and Pollock, M. "Changing the Communication Culture of Distributed Teams in a World Where Communication is Neither Perfect nor Complete" *The Electronic Journal Information Systems Evaluation Volume 13 Issue 2 2010, (pp187 - 196), available online at www.ejise.com*

argue that a lack of media richness decreases the efficiency of communication even further and can lead to decreased trust and commitment within a group (Watson-Manheim & Bélanger 2002). This, in turn, increases the transaction cost and time to complete a project. It further leads to reduced quality of the deliverables and a reduced satisfaction of the team members. In addition, social loafing, a problem in any working group, may be easier in virtual teams where team members' actions are less visible (Chidambaram & Tung 2006).

In times of mobile technology, globalisation and the Internet there is almost ubiquitous availability of high bandwidth enabling the world to substitute face-to-face human interaction with computer-mediated communication technologies in some instances. Computer-mediated communication plays an increasing role in many people's lives as a growing number of people socialise and shop online (Townsend, DeMarie, & Hendrickson 1998). According to Townsend et al. (1998) this may well transform the virtual team from an innovative source of competitive advantage into the dominant organisational project form. Many companies apply ICT technologies to support their distributed project teams. This technological support enables the teams to become more agile. They rapidly recruit scarce expert resources from all over the world, thus gaining a competitive advantage on the global market (Bergiel, Bergiel, & Balsmeier 2008).

According to Martins, Gilson and Maynard (2004) one major methodological concern with the current state of the literature on virtual or distributed teams is that much of the empirical research has been conducted in laboratory settings, using student teams working on short-term tasks. This case study based paper analyses the communication culture and tools of "real" distributed teams of a large German manufacturer to identify ways of improving companies' communication culture within their distributed teams. The experience of project managers on long term task projects formed the main source of data. The field work was conducted using semi-structured interviews based on a questionnaire with closed- and open-ended questions. Based on the findings and in line with DeSanctis and Monge (1999) we can argue that if technology, organisational structure and communi-cation patterns are not harmonised within distributed teams, team members' efficiency and satisfaction will be negatively influenced.

## 2. Virtual teams

### 2.1 Definitions

During the last decade there has been a proliferation of definitions of virtual teams due to the growing literature in the field. A close look at these definitions shows a considerable overlap in core areas and small variations in specifics.

According to Hertel, Konradt, & Orlikowski (2004) a virtual team is a group of geographically distributed and organisationally dispersed workers performing one or more tasks that are supported by information and communication technology. According to Powell, Piccoli, & Ives (2004, p. 7) distinctive features of a virtual team are

> *"their preponderant - and at times exclusive – reliance on information technology to communicate with each other, their flexible compositions, and their ability, if necessary, to traverse traditional organizational boundaries and time constraints."*

In DeSanctis and Monge's (1999, p. 694) definition other important issues of a virtual organisation being

> *"geographically distributed, functionally or culturally diverse, electronically linked, and connected via lateral relationships,"*

are raised .In their definition the *cultural* or functional diversity are important attributes of a virtual organisation. Instead of defining virtual teams as a type of team that contrasts with *traditional* or face-*to-face* teams Martins, Gilson, & Maynard (2004) concur that definitions rather focus on *virtualness* as a potential characteristic of all teams.

### 2.2 Advantages and disadvantages of virtual teams

In the literature (e.g., (Bergiel, Bergiel, & Balsmeier 2008) and (Lipnack & Stamps 1997)) many advantages and disadvantages for virtual teams are proposed and partly (see, e.g., De Pillis & Furumo 2007) discussed critically. The following table (Table 1) briefly describes the main advantages

and disadvantages in general, some of them are dependent on the kind of communication media used. It is important to note that advantages and disadvantages in adjacent cells are not necessarily related.

**Table 1**: Proposed advantages and disadvantages of virtual teams

| Advantages | Disadvantages |
|---|---|
| Potential decrease in travel time and costs (Gillam & Oppenheim 2006); (Bergiel, Bergiel, & Balsmeier 2008); (Kayworth & Leidner 2000) | The virtual structure may not fit into the operational environment (Gillam & Oppenheim 2006) |
| Responsiveness (Bergiel, Bergiel, & Balsmeier 2008) | Lack of expertise in technological application related to teaming among some mature senior managers (Gillam & Oppenheim 2006) |
| Higher flexibility (Bergiel, Bergiel, & Balsmeier 2008), flexibility in balancing personal and profes-sional life (Gillam & Oppenheim 2006) | Not an option for every type of employee because of an employee's psychological make-up and other predispositions (Gillam & Oppenheim 2006) |
| Reduces discrimination (Bergiel, Bergiel, & Balsmeier 2008); opportunities for physically handicapped people to work in a non-traditional environment (Gillam & Oppenheim 2006) | Potential decrease in efficiency due to free-riding (de Pillis & Furumo 2007); (de Pillis & Furumo 2006) |
| Teams of experts and best competencies – Maximize the expertise without having physically to relocate individuals (Bergiel, Bergiel, & Balsmeier 2008); (Gillam & Oppenheim 2006); (Kayworth & Leidner 2000) | Extremely difficult and less effective communication and therefore reduced efficiency (Kayworth & Leidner 2000); (de Pillis & Furumo 2007); (McGrath & Hollingshead 1994) |
| Diversity forces creativity (Bergiel, Bergiel, & Balsmeier 2008) | More project risk due to insufficient knowledge transfer (Reed & Knight 2010) |

From the above it is evident that communication media play an integral role in team activities and the majority of definitions (e.g. (Hertel, Konradt, & Orlikowski 2004) and (Powell, Piccoli, & Ives 2004)) state that virtual teams are functioning teams who rely on technology-based communication while crossing several different boundaries. The coordinates of time, place and organisation can thus be used to highlight the different boundaries and define the characteristics of different virtual teams (Gillam & Oppenheim 2006).

## 3. Communication technology, social context and culture

The communication process is a crucial part of the success of any virtual team. Research results of Jarvenpaa, Knoll, & Leidner (1998) and Jarvenpaa and Leidner (1999) demonstrate that successful virtual teams have extended and predictable *communication patterns*. Virtual teams also communicate more frequently with each other than do traditional project teams (Galegher & Kraut 1994). Connaughton and Shuffler (2007) confirmed that frequency and face-to-face communication emerge consistently in research related to virtual teams and Hinds and Mortensen (2005) concur that frequent communication enhances shared team identity and therefore moderates *the effect of distribution on interpersonal conflict*. Through frequent communication team members are able to share their experiences and more effectively manage their incomplete and imperfect communication. Research from Jarvenpaa, Knoll and Leidner (1998) and Jarvenpaa and Leidner (1999) revealed that frequent communication increases the trust in the teams. Further findings are that predictable communication with regular feedback has been associated with improved team performance ((Jarvenpaa & Leidner 1999); (Jarvenpaa, Knoll, & Leidner 1998); (Kayworth & Leidner 2000) and (Maznevski & Chudoba 2000)). Some research considers face-to-face communication as necessary to foster trust (Oertig & Buegri 2006), reduce task conflict (Hinds & Mortensen 2005), enhance team dynamics and in turn increase team effectiveness ((Maznevski & Chudoba 2000) and (Grosse 2002)).

### 3.1 Communication technology for virtual teams

Using technology is essential to mediate communication in a distributed environment. Collaborative work technology can be classified according to four main dimensions (Jude-York, Davis, & Wise 2000):

- Same time/same place (e.g. networked computer in a laboratory)
- Same time/different place (e.g. chat, skype, phone conference, phone)

- Different time/same place (e.g. bulletin boards)
- Different time/different place (e.g. email, text message, web-based project management tools)

In selecting and classifying communication technologies for use in virtual teams, one theory that is widely applied and cited (e.g. (Burke, Aytes, & Chidambaram 2001); (D'Ambra, Rice, & O'Connor 1998); (Lee A. S. 1994) and (Ngwenyama & Lee 1997)) is the Media Richness Theory (MRT), sometimes also referred to as the Information Richness Theory. This theory is based on the work of Daft and Lengel (1984 and 1986) and Daft, Lengel and Trevino (1987). MRT is a theory that can be used to describe the ability of communication media to transfer information. It assumes that organisations process information to reduce uncertainty and unequivocality (Daft & Lengel 1986).

According to Schiller & Mandviwalla (2007) MRT suggests that media vary in the levels of richness they provide. Media might differ in the number of cues they are able to convey, the timeliness of feedback, and the capacity for natural expression. The more of these factors a medium covers the richer it is. Therefore face-to-face can be considered as the richest medium. It permits timely feedback, allows the simultaneous communication of multiple cues like body language, facial expression and tone of voice, and uses high-variety natural language that conveys emotion. Video conferencing, phone, chat (instant messaging), email, text messaging, addressed written documents (e.g., notes, memos, letters), and unaddressed documents (e.g., bulletins, standard reports) follow face-to-face communication in media richness in a descending order. The level richness of each medium is set out below in Table 2.

**Table 2**: Level of richness of communication media

| Medium | Timely feedback | Body language | Facial expression | Tone of voice | Convey emotion | Convey message | Equivocality |
|---|---|---|---|---|---|---|---|
| Face-to-face | √ | √ | √ | √ | √ | √ | Equivocal |
| Video conferencing | √ | | √ | √ | √ | √ | Equivocal |
| Phone | √ | | | √ | √ | √ | Equivocal |
| Chat | √ | | | | √ | √ | Equivocal |
| Email | | | | | | √ | Unequivocal |
| Text messaging | | | | | | √ | Unequivocal |
| Written documents | | | | | | √ | Unequivocal |

MRT further proposes that task performance will be improved when task-information processing requirements are matched to a medium's ability to provide that information richness. Daft and Lengel (1984) found that commonly used media in organisations work better for certain tasks than other media. They specifically concluded that written media are preferred for unequivocal messages while face-to-face media are preferred for messages containing equivocality. Even though this theory is widely applied there are some studies that do not support the media richness theory regarding its effect on the task performance and satisfaction (e.g., (Dennis & Kinney, 1998) and (Suh, 1999)). Goodhue (1995) suggests in his task-technology fit model that a technology has to take into account the utilization for the tasks and the goodness of fit to have a positive impact on the user's individual performance.

Kock (2004) developed the media naturalness theory to understand the user's behaviour towards communication media. The media naturalness theory is a psychological model and can be considered, according to Kock et al. (2008), as a Darwinian theory of behaviour regarding different types of communication media. He argues that the evolutionary process of the last thousand years has led to the development of our brain that is consequently designed for face to face communication. Other forms of communication are too recent to have an impact on the development of our brain. Using electronic communication tools that suppress key elements in face-to-face communication create cognitive obstacles in the communication. This is especially important for complex tasks as they demand more intensive communication than simple tasks.

## 3.2 Communication and social context

As pointed out by Connaughton & Shuffler (2007) the two aspects of communication, namely frequency and face-to-face communication, emerge consistently in research related to virtual teams. According to Hinds & Mortensen (2005) frequent communication enhances shared team identity and moderates the distance conflict relationships. Further findings are that predictable communication with

regular feedback has been associated with improved team performance (e.g., (Jarvenpaa & Leidner 1999) and (Maznevski & Chudoba 2000)). Some research considers face-to-face communication as necessary to foster trust (Oertig & Buegri 2006), reduce task conflict (Hinds & Mortensen 2005), enhance team dynamics and in turn increase team effectiveness ((Maznevski & Chudoba 2000), (Maznevski & Chudoba 2000) and (Grosse 2002)). Face-to-face meetings, e.g. in the team forming phase, seem to enhance virtual team trust (Duarte & Snyder 2001) and is, according to Grosse (2002), perceived as critical early on in a team's development.

Even though frequency and face-to-face-communication are relevant aspects of communication they alone do not cover the complexity of communication. According to Suchman (1987) and Weick (1993) teamwork is dependent on how well the team members are socialised into the organisational context. According to some Information Systems researchers all actions, such as communicative actions, are socially oriented and performed within a defined social context ((Lyytinen & Ngwenyama 1992); (Ngwenyama & Lee 1997) and (Ngwenyama 1998)). For Ngwenyama and Lee (1997) the organisational context is a foundational element for the development of shared meaning for all organisational actors. Many authors, including de Pillis & Furumo (2007), doubt that virtual teams can reach a similar performance level as face-to-face teams due to communication deficiencies and visibility of team members. According to de Pillis and Furumo (2007) virtual teams are often less efficient and therefore have increased transaction costs and increased time to complete their project.

### 3.3 Communication culture

As communication is the key to the success of project teams in a distributed environment, many virtual team issues such as conflict management, trust or team cohesion are rooted in team communication behaviours and processes. The communicative action is therefore an essential feature of virtual teamwork. Many researchers ((Olson & Olson 2000), (Cramton 2001) and (Bjørn & Hertzum 2006)) have found that this communicative action is dependent on the process of establishing common ground and a shared meaning context. A failure to establish and maintain this common ground and shared meaning context might, according to Cramton (2001), result in breakdowns of the teamwork. New virtual teams especially have an increased risk of communication breakdowns (Hinds & Mortensen 2005).

According to Dube and Pare (2001) culture comes in many different forms such as functional culture, organisational culture and national culture. While culture itself can be defined as

> *"the collective programming of the mind which distinguishes the members of one human group from another" (Hofstede 1980).*

Comments like the above emphasize that a team's communication culture, which is formed in part by the company's organisational structure, describes its collective communication behaviour and processes and includes communication rules as investigated within our research approach.

## 4. Research approach

An interpretative case study methodology ((Klein & Myers 1999) and (Walsham 2002)) was used to study the communication technology and culture in distributed teams of a large German manufacturer. The interview data was obtained from the general project managers responsible for the individual whole projects as well as the local project managers responsible for the local project teams. The teams worked for a large German manufacturer on contract-based, distributed projects in up to four places in different countries (Germany, Switzerland and Italy). All project managers had experience of working in distributed project teams. The data collection and sampling is summarized in Table 3. First the issues influencing the communication culture in distributed teams in a large manufacturing company that worked over several locations for several years are investigated. Second, the communication tools used in these teams over the past years and what can be done to enhance the communication within these distributed teams are investigated.

**Table 3**: Data collected in the cases

| | Location 1 (Germany) | Location 2 (Switzerland) | Total |
|---|---|---|---|
| Number of general project managers interviewed | 4 | 7 | 11 |
| Number of local project managers interviewed | 11 | 4 | 15 |

The data was collected via interviews. The interview questionnaire was semi-structured and comprised closed- and open-ended questions. The interview questions were given to the interviewee beforehand. The interviews were conducted either on site or, if not possible, over the phone. The interview data was handled anonymously.

## 5. Results

In this case study of a large German manufacturer the average general project manager has been participating in 21 traditional projects and 5 distributed projects, and the average local project manager has been involved in 48 on-site projects and 9 distributed projects. The project managers reported that phone and email dominated the communication media usage (See table 4). The usage frequency of face-to-face team meetings, video conference and phone conference were seen as average. Several project managers pointed out that the frequency of these communication activities would depend on the task complexity and the phase of the project. At this point no Internet based net meetings and chat tools have yet been utilised and only three of the project managers interviewed, were familiar with tools for video meetings using the Internet.

According to the project managers of this case study one of the most important tools is email. They unanimously agreed that email represents a very helpful tool to support their distributed work setting. In the case study the project managers send or receive between 80 and 200 emails per week. 17 out of 26 project managers however complained that too many emails are sent and that some of them caused misunderstanding. The general consent amongst all project managers was that on average 11% of all emails are unclear. Considering that 80 to 200 email are sent per week this means that between 9 and 22 emails per project manager are unclear and the cause of misunderstandings. In addition the project managers complained that only on rare occasions did team members phone back to clarify project information.

**Table 4**: Usage frequency of the communication tools in the distributed teams

| Tool | Daily | Weekly | Monthly | Every half a year | Never |
|---|---|---|---|---|---|
| Team meeting | | | x | x | |
| Video conference | | | | x | |
| Net meeting | | | | | x |
| Telephone conference (at least 3 people) | | x | x | x | |
| Phone | x | | | | |
| Chat | | | | | x |
| Email | x | | | | |

Video conferencing is one of the activities that is set up at least every half a year and the first video conference is usually the internal Kick-Off meeting of the whole team. The communication patterns as well as the technical set up of the video conferencing is heavily criticised by both the local and the general project managers. While the local project managers classify video conferencing as an activity that is sometimes useful, general project managers view them as not useful. The list below summarises some of the most relevant criticism from the interviewees and confirms the disadvantage mentioned in Table 1 of communication being problematic and “extremely difficult”.

- Insufficient quality of optic and acoustic communication
- Connection problems
- Problematic eye contact
- Dominant role of the project manager
- In contrast to face to face meeting participants experience an inhibition threshold

Depending on the team the general and local project managers are relatively happy with their distributed team work, even though they do feel that they have more control should the whole team be in one location only. When asked about the differences between virtual and traditional teams one of the general project manager said:

> *“...working with the team on one location only the communication is easier and more individual. The distributed work setting the communication is much more complicated and I have to demonstrate more empathy and have to take into account the different organisational culture of the location...”*

 

One of the specific problems mentioned was the lack of team activities like scheduled team building exercises. Nine of the local project managers complained that team building seldom takes place. They report that although there used to be team building activities in the past, these no longer occur in the last few years. Trust and social relationship is seen as an important factor in the work of distributed teams as one local project manager confirms:

> *"If I do know the people personally it is not important where they are when working together in a project"*

Team members often complain about a misuse of the different tools, limited or complete lack of communication rules for the different tools as well as in the face-to-face meetings. Project managers perceive that the reduced efficiency in the distributed teams can be attributed to communication based issues like:

- Extended communication channels
- The average response time being too long
- No responses (especially on emails)
- Insufficient presence of the project manager on site to discuss problems
- Not enough follow-up informal meetings to build up trust after the kick-off meeting
- More information on specific team member activities

Video conferencing and the use of email are often inefficient and lead to team members' frustration. In the light of the above local and general project managers propose several improvements to communication culture in the virtual team setting, listed below:

- Support of Face-to-Face Kick-off meetings and more face to face meetings
- Early invitation to the different meetings (face-to-face as well as video conference)
- Introduction of a "jour fix" (regular meeting)
- More informal team meetings
- More team meetings of the local teams
- Improvement of the moderation and technology of the video conferencing
- Reduction of long communication channels
- General and media specific improvement of the communication rules regarding
- *Emails (e.g. reply time on emails; content in the topic line; reply of emails which document attachment; language choice within emails)*
- *Meetings (e.g. schedule, participation, agenda)*
- *Video conferencing*

In addition task-media advice rules were discussed taking into account the characteristics of the different media as well as task characteristics (see Section 3.1). These task-media-advice rules assign specific tasks to the different communication media (see Table 5).

**Table 5**: Task-media advice rules

| Specific Tasks | Recommended Media |
|---|---|
| Distribute pure information | Email |
| Explain decisions | Depending on the complexity: email, phone, videoconferencing, face-to-face |
| Share documents | Email, shared drives |
| Solve Conflicts | Depending on the gravity: phone, videoconferencing, face-to-face |
| Emergencies | Phone |
| Exchange of views | Depending on the complexity of the problem: email, phone video |
| Manage Relationships | Email, phone |

## 6. Discussion

As pointed out from DeSanctis and Monge (1999) technology, organisational structure and communication patterns are all tightly coupled. This case study shows that having virtual teams in place as an organisational structure constitute a need to adapt the communication pattern. A failure to comply reduces the efficiency of the virtual teams. This is in line with previous research results (e.g., (Jarvenpaa & Leidner 1999); (Jarvenpaa, Knoll, & Leidner 1998) and (Kayworth & Leidner 2000)).

Results show that even though there are a variety of communication tools available, regular face-to-face meetings, email and phone still play an important role. We agree with previous research ((Oertig & Buegri 2006) and (Grosse 2002)) that frequency of face-to-face interaction remains an important variable for virtual team performance (Maznevski & Chudoba 2000) and that a common ground ((Bjørn & Hertzum 2006); (Cramton 2001) and (Olson & Olson 2000)), shared experience (Cockburn, 2006), shared meaning ((Bjørn & Ngwenyama, 2009) and (Nunamaker, Reinig, & Briggs 2009)) and the task complexity all contribute to the necessity for face-to-face meetings. This need for common ground and shared meaning (experience) was clearly shown by the number of emails project managers found to be unclear and misunderstood (an average of 11%). This problem is exacerbated by task complexity which requires a richer form of communication media, such as phone calls or video conference, to create understanding. However in this case study a richer communication medium was only used occasionally. Available tools are not enough to bridge the communication gap in virtual teams; some management techniques are required too. These management techniques include proper use of communication tools and communication rules. This case study represents an example of a case where communication tools were not used in a managed way, and where there were limited or a complete lack of communication rules, leading to breakdowns in communication and misunderstandings. Trust and social relationship between team members goes far to create a common ground and shared meaning. This trust and social relationship is usually built in team building exercises, which should be scheduled at the beginning of a project. In this case study this was seldom done, which may have led to the communications problems experienced within the teams.

According to de Pillis & Furumo (2007) virtual teams are often less efficient and therefore have increased transaction cost and increased time to complete their project. Our research results partly support the argument that virtual teams can't reach a similar performance level as traditional teams due to communication deficiencies and visibility of team members.

In this case study no mention is made of Internet-based net meetings and chat tools to have richer or synchronous communication compared to media like phone conferences or email. Research work from Hollingshead, McGrath, & O'Connor (1993) and Robey, Khoo, & Powers (2000) hypothesised that the team's choice of technology depends on their experience with the technology available, its ease of use, individual preferences and the urgency of the task.

We also argue that depending on previous experience in working in distributed settings, teams seem to develop some kind of media stickiness (Huysman, et al., 2003) to the media they are used to, even if they are less efficient. This clearly happened within this case study, as teams continued to use the communication tools familiar to them – face-to-face meetings, email and phone. This media stickiness meant that the teams did not use the tools most appropriate for their virtual environment, but rather those most familiar. Even during the discussion of future media usage and task-media advice rules the teams stuck to the communication media familiar to them. Virtual teams require more overhead, such as training in the use of tools, training about when to use certain tools as well as the establishing of communication rules to run effectively. In the case study these team setup tasks were not carried out, resulting in teams not running efficiently or effectively.

## 7. References

Bergiel, B.J., Bergiel, E.B., & Balsmeier, P.W. (2008) Nature of Virtual Teams: A Summary of Their Advantages and Disadvantages. *Management Research News*, Vol 31, No. 2, pp99-110.

Bjørn, P., & Hertzum, M. (2006) Project-based Collaborative Learning: Negotiating Leadership and Commitment in Virtual Teams. *5th Conference on Human Computer Interaction in Southern Africa* (pp6-15). Cape Town, South Africa: Greunen D.V.(ed.).

Bjørn, P., & Ngwenyama, O.K. (2009) Virtual Team Collaboration: Building Shared Meaning, Resolving Breakdowns and Creating Translucence. *Information Systems Journal* Vol 19, No. 3, pp227-253.

Burke, K., Aytes, K., & Chidambaram, L. (2001) Media Effects on the Development of Cohesion and Process Satisfaction in Computer-Supported Workgroups: An Analysis of Results From two Longitudinal Studies. *Information Technology and People*, Vol 14, No. 21, pp122-141.

Chidambaram, L., & Tung, L.L. (2006) Is Out of Sight, Out of Mind? An Empirical Study of Social Loafing in Technology-supported Groups. *Information Systems Research*, Vol 16, No. 2, pp149–168.

Connaughton, S.L., & Shuffler, M. (2007) Multinational and Multicultural Distributed Teams: A Review and Future Agenda. *Small Group Research*, Vol 38, No. 3, pp387-412.

Cramton, C.D. (2001) The Mutual Knowledge Problem and its Consequences for Dispersed Collaboration. *Organization Science*, Vol 12, No. 3, pp346-371.

Cockburn, A. (2006) *Agile Software Development*, Second edition, Addison-Wesley Professional..

Daft, R.L., & Lengel, R.H. (1984) Information Richness: A New Approach to Managerial Behavior and Organizational Design. In L.L. Cummings, & B.M. Staw (Eds.), *Research in Organizational Behavior* (pp191-233). Homewood, IL: JAI Press.

Daft, R.L., & Lengel, R.H. (1986) Organizational Information Requirements, Media Richness and Structural Design. *Management Science*, Vol 32, No. 5, pp554-571.

Daft, R.L., Lengel, R.H., & Trevino, L. K. (1987) Message Equivocality, Media Selection, and Manager Performance Implications r Information Systems. *MIS Quarterly*, Vol 11, No. 3, pp354-366.

D'Ambra, J.R., Rice, R.E., & O'Connor, M. (1998) Computer-mediated Communication and Media Preference: An Investigation of the Dimensionality of Perceived Task Equivocality and Media Richness. *Behaviour and Information Technology*, Vol 17, No. 3, pp164-174.

de Pillis, E., & Furumo, K. (2007) Counting the Costs of Virtual Teams. *Communication of the ACM*, Vol 50, No. 12, pp93-95.

de Pillis, E., & Furumo, K. (2006) Virtual vs. Face-to-Face Teams: Deadbeats, Deserters, and Other Considerations. *SIGMIS-CPR'06* (pp318-320). Claremont, CA: ACM.

DeSanctis, G., & Monge, P. (1999) Introduction to the Special Issue: Communication Processes for Virtual Organizations. *Organization Science*, Vol 10, No. 6, pp693-703.

Duarte, D.L., & Snyder, N.T. (2001) *Mastering Virtual Teams.* San Francisco: Jossey-Bass.

Fiol, C., & O'Connor, E. (2005) Identification in Face-to-face, Hybrid, and Pure Virtual Teams: Untangling the Contradictions. *Organization Science*, Vol 16, No. 1, pp19-32.

Galegher, J., & Kraut, R. E. (1994) Computer-mediated Communication of Intellectual Teamwork: An Experiment on Group Writing. *Information Systems Research*, Vol 5, No. 2, pp110-138.

Gillam, C., & Oppenheim, C. (2006) Reviewing the Impact of Virtual Teams in the Information Age. *Journal of Information Science*, Vol 32, No. 2, pp160-175.

Goodhue, D. L. (1995). Task-Technology Fit and Individual Performance. *MIS Quarterly, Vol 19, No.* 2, pp213-236.

Grosse, C.U. (2002) Managing Communication Within Virtual Intercultural Teams. *Business Communication Quarterly*, Vol. 65, pp22-38.

Hertel, G., Konradt, U., & Orlikowski, B. (2004) Managing Distance by Interdependence: Goal Setting, Task Interdependence and Team-based Rewards in Virtual Teams. *European Journal of Work and Organizational Psychology*, Vol 13, No. 1, pp1-28.

Hinds, P.J., & Mortensen, M. (2005) Understanding Conflict in Geographically Distributed Teams: The Moderating Effects of Shared Identity, Shared context, and Spontaneous Communication. *Organization Science*, Vol 16, No. 3, pp290-307.

Hofstede, G.J. (1980) *Culture's Consequences.* Beverly Hills, CA: Sage.

Hollingshead, A. B., McGrath, J., & O'Connor, K. (1993) Group Task Performance and Communication Technology: A Longitudinal Study of Computer-mediated versus Face-to-face Groups. *Small Groups Research*, Vol 24, No. 3, pp307-333.

Huysman, M., Steinfield, C., Chyng-Chang, J., Kenneth, D., Huis in 'T Veld, M., Poot, J., et al. (2003) Virtual Groups and the Exploration of Communication Technology: Exploring the Concept of Media Stickiness. *Computer Supported Cooperative Work: The Journal of Collaborative Computing*, Vol 12, pp411-437.

Jarvenpaa, S., & Leidner, D. (1999) Communication and Trust in Global Virtual Teams. *Organization Science*, Vol 10, No. 6, pp791-815.

Jarvenpaa, S., Knoll, K., & Leidner, D. (1998) Is Anybody out There? Antecedents of Trust in Global Virtual Teams. *Journal of Management Information Systems*, Vol 14, No. 4, pp29-64.

Jude-York, D., Davis, L.D., & Wise, S.L. (2000) *Virtual Teaming Breaking the Boundaries of Time and Place.* California: Crisp Publications.

Kayworth, T., & Leidner, D. (2000) The Global Virtual Manager: A Prescription for Success. *European Management Journal*, Vol 18, No. 2, pp183-194.

Klein, H.K., & Myers, M.D. (1999) A Set of Principles for Conducting And Evaluating Interpretive Field Studies in Information Systems. *MIS Quarterly*, Vol 23, No. 1, pp67–94.

Kock, N. (2004). The Psychobiological Model: Towards a New Theory of Computer-Mediated Communication Based on Darwinian Evolution. *Organization Science, Vol. 15*, No. 3, pp327-348.

Lee, A.S. (1994) Electronic Mail as a Medium for Rich Communication: An Empirical Investigation Using Hermeneutic Interpretation. *MIS Quarterly*, Vol 19, No. 2, pp143-157.

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

Lyytinen, K. J., & Ngwenyama, O. K. (1992). What Does Computer Support for Cooperative Work Mean? A Structurational Analysis of Computer Supported Cooperative Work. *Accounting Management and Information Technology, Vol 2,* No 1, pp19–37.

Martins, L.L., Gilson, L.L., & Maynard, M.T. (2004) Virtual Teams: What Do We Know and Where Do We Go From Here? *Journal of Management*, Vol 30, No. 6, pp805-835.

Maznevski, M.L., & Chudoba, K.M. (2000) Bridging Space Over Time: Global Virtual Team Dynamics and Effectiveness. *Organization Science*, Vol 11, No. 5, pp473-492.

McGrath, J.E., & Hollingshead, A.B. (1994) *Groups Interacting with Technology.* Thousand Oaks, CA: Sage Publications.

Ngwenyama, O.K., & Lee, A. (1997) Communication Richness in Electronic Mail: Critical Social Theory and the Contextuality of Meaning. *MIS Quarterly*, *Vol 21, No. 2*, pp145-167.

Ngwenyama, O. K. (1998). Groupware, Social Action and Organizational Emergence: On the Process Dynamics of Computer Mediated Distributed Work. *Accounting Management and Information Technology, Vol 8*, pp127–146.

Nunamaker, J.F., Reinig, B.A., & Briggs, R.O. (2009) Principles for Effective Virtual Teamwork, *Communication of the ACM,* Vol 52, No. 4, pp113-117.

Oertig, M., & Buegri, T. (2006) The Challenges of Managing Cross-Cultural Virtual Project Teams. *Team Performance Management*, Vol 12, No. 1-2, pp23-30.

Olson, G.M., & Olson, J.S. (2000) Distance Matters. *Human-Computer Interaction*, *15*, pp139–178.

Powell, A., Piccoli, G., & Ives, B. (2004) Virtual Teams: A Review of Current Literature and Directions for Future Research. *ACM SIGMIS Database,* Vol 35, No. 1, pp6-36.

Reed, A.H., & Knight, L.V. (2010) Effect of a virtual project team environment on communication-related project risk. *International Journal of Project Management,* Vol 28, No. 7, pp422-427.

Robey, D., Khoo, H., & Powers, C. (2000) Situated Learning in Cross-functional Virtual Teams. *IEEE Transaction on Professional Communications,* Vol 43, No. 1, pp51-66.

Schiller, S.Z., & Mandviwalla, M. (2007) Virtual Team Research: An Analysis of Theory Use and a Framework for Theory Appropriation. *Small Group Research*, Vol 38, No. 12, pp12-59.

Suchman, L. (1987). *Plans and Situated Actions.The Problem of Human Machine Communication.* Cambridge, UK: Cambridge University Press.

Townsend, A.M., DeMarie, S.M., & Hendrickson, A.R. (1998) Virtual Teams: Technology and the Workplace of the Future. *The Academy of Management Executive*, Vol 12, No. 3, pp17-29.

Walsham, G. (2002) Interpretive Case Studies in IS Research: Nature and Method. In M. Myers, & D. Avison (Eds.), *Qualitative Research in Information Systems.* London, UK: Sage Publications.

Watson-Manheim, M.B., & Bélanger, F. (2002) Support for Communication-based Work Processes in Virtual Work. *E-Service Journal*, Vol 2, No. 2, pp61-82.

Weick, K. (1993). The Collapse of Sensemaking in Organizations: The Mann Gulch Disaster. *Administrative Science Quarterly, Vol 38*, pp628–652.