Selection and adoption of communication technology in a distributed network

Joanna Kalalahti

University of Tampere, TRIM Research Center, FINLAND, joanna.kalalahti@uta.fi

Mika Sihvonen

University of Tampere, TRIM Research Center, FINLAND, mika.sihvonen@uta.fi

Abstract

In recent years there has been a lot of effort to foster better communication between the development projects. Without communication in the project network, results of the project will remain in the level of unconnected statements and findings. To enable the communication and accordingly, information sharing and building of a common view, there must be a certain degree of familiarity, sense of belonging together and a common ground between the project actors. Since the project actors are geographically distributed, a technology mediated channel is needed for communication. It also promotes becoming acquainted with each other and building trust which is prerequisites for fluent communication.

We introduce the results of two separate sub-studies, which are part of larger project research. Sub-studies concentrate on the following research questions: What kind of technology should be chosen to support the communication in a physically distributed project network? How social media is based communication technology adopted by the project actors? We will also present our findings concerning other than technology related issues in technology selection. We suggest that social media tools have characteristics that may be valuable in distributed communication, but they also bring new challenges concerning technology adoption and acceptance processes, when less advanced users are concerned.

Previous studies have helped in setting up a framework for technology selection for distributed teams, but new social media tools and their potential for intended communication haven't been studied much. We suggest that features of social media tools bring new possibilities and also challenges for the adoption of technologies, especially for less advanced users who don't belong to networks of more advanced users. More advanced users seem to try new technologies quite fluently, but they may give up using them quickly, if the tools don't fit for their requirements and purposes.

We found several references about the features which should be present in a tool which will support communication. Also other features which are important prerequisites for communication in such a network were found. Familiarity of the project actors and willingness to work together, informal communication and contextual and situational issues and personal preferences for different kind of tools were found to have be important or have an effect on the communication.

Keywords

communication technology, distributed networks, technology selection, virtual presence, sense of a virtual community, social media.

Network of development projects

European Social Fund supported network of projects entitled Active Citizen of the Open Learning Environment (AKTIIVI) consists of 17 participatory projects. The participatory projects are developing new practices to correspond to the demands of the information society and to promote active citizenship using new tools and ways of action. The main activities of AKTIIVI are networking, building partnerships between the participatory projects, supporting open and cooperative communities and working methods and disseminating best practices. Open Networks for Learning (AVO) is one of the participator projects of AKTIIVI and it, for one, consists of 11

ISBN 978-1-86220-283-2

participatory projects. Main objectives of AVO are facilitating the open content production, usage of social media tools and networking. AVO also pilots different tools and shares the experiences to its target group and AKTIIVI network. A project research is an integral part of AKTIIVI and AVO.

Theoretical background

Not even the best possible communication technologies are sufficient, if the preconditions for fluid communication are not taken care of. We see the corner stone of good communication consisting of 1) a sense of belonging together and a common goal and 2) sharing the information and knowledge. These aspects are partly interconnected with 3) the technology selection, which is both affected by and affecting it.

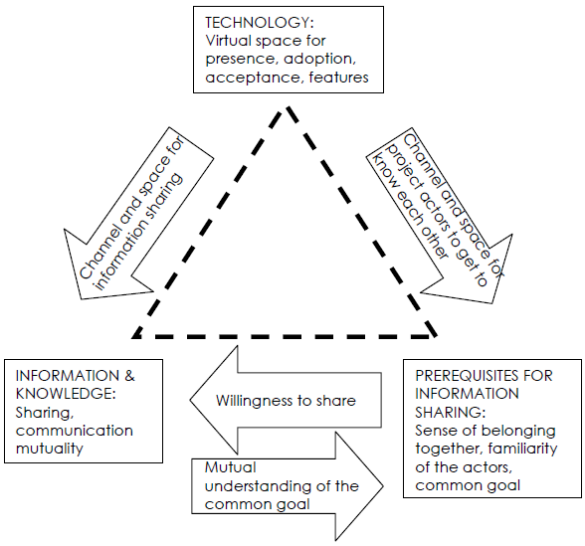

Figure 1. Elements of successful communication in a distributed network.

Sense of belonging together and a common goal

Networked model of action has been set as an ideal what comes to the organization of activities in larger network of development project. According to Wellman and Leighton (1979), a loose network is effective in distributing resources between the actors, but tight network is effective in mobilizing actors towards common. In order to work effectively together and achieve common goals, there is a need for at least some kind of sense of belonging together. McMillan and Chavis (1986) have defined a feeling of belonging, a feeling that members matter to one another and to the group, and a shared faith that member's needs will be met through their commitment to be together, as Sense of a Community (SOC).

It is also possible to achieve Sense of a Community in virtual settings – Sense of a Virtual Community (SOVC). SOC (or SOVC) is not necessarily present in every community, but its appearance has positive effects, like active participation, facilitation of virtual collaboration and enhancing knowledge sharing. Its antecedents trust, depth of relationships and shared understanding between the actors will result high level of collaboration. (Blanchard & Markus, 2004; Peters & Manz, 2007.)

Identification can be seen as a part of sense of belonging together. According to Sivunen (2007), communication is an essential part of the process of identification to the team. Identification appears and is built through cognitive level (members are aware of each other), communication relationship level (social relationships between team members) and behavioural level (identifying the goals and aiming for them). There are two levels of identification – individual identification and group identification. In the individual level, the activity of the team is seen to consist of individuals working separately for the common goal, but in the group level, team is seen as a unity working together for the common goal. Identification to the team will have positive effects on work activities, but achieving it may be challenging for distributed teams.

Even though people seek different issues in networks (information, co-working, support etc.) and the same network usually means different things for different people (Wellman, 2001), a sense of belonging together and group level identification should be strived in a community or network which has common goals, like AKTIIVI and AVO.

ISBN 978-1-86220-283-2

Common ground for information and knowledge sharing in a distributed network goal

In order to successfully share information, group needs a common ground, which consists of mutual knowledge and the awareness that the others also share it (Cramton, 2001; Clark & Brennan, 1991; Olson & Olson, 2000). Achieving common ground in a distributed (or dispersed) group is challenging because of the characteristics of technology mediated communication (e.g. slowness, lack of communicational hints available in face-to-face communication, uncertainty if the information has been received and understood by others). Also certain problems have been found concerning the mutual knowledge in dispersed teams. For example failure to communicate and retain contextual information, unevenly distributed information, difficulty communicating and understanding the salience of information, differences in speed of access to information and difficulty in interpreting meaning of silence are identified. If there is not enough communication between the team members, there is also a risk that the uniquely held information of individual team members will not end up to be commonly held, mutual information of the group, even though it was crucial. (Cramton, 2001.)

Selection and adoption of communication technology for a distributed network

Traditionally technology mediated interaction in organizations has been studied from many different viewpoints, of which one is the processes of technology selection. It can be divided to two main tendencies. In the tendency of rational choice, arguments for technology selection are affected by technological characteristics. One of the rational choice theories is technology richness theory. According to it, face-to-face communication is seen as the richest technology to which technology is compared. The closer a technology is to face-to-face communication, the better it is. In the tendency of social impact, technology selection is based on the preferences and choices of others in the same community. Also a third viewpoint of adaptive structuration may be taken, according to which the technology usage should be studied as a part of the social community where it is used. (Sivunen, 2007.)

There is also a need for a model for technology acceptance in the domain of social media. Different factors such as social pressure, reputation, contacts and commentary are not considered in the original TAM model (Davis, 1989). Günther et al (2009) presented the UTAUT model extension, which was based on their study of microblogging in enterprise. They added some new features to the original UTAUT model (see e.g. Venkatesh et al., 2003), which allow the model to be better modified for social media adoption: anticipated reputation gains of the user and expected relationships which may predict the knowledge sharing behaviour of the user, codification effort which is the expectancy of the time that should be used for the usage of the system, signal-to-noise ratio e.g. how much noise the communication channel increases and how much trivial information is communicated, and privacy concerns about who is able to see the information and how to use it. While the original acceptance models concentrate on single-user factors such as ease of use and beneficial issues, there are many open questions about how the nature of social media tools and the very crucial feature of them, the social community and users' high dependence on it, is affecting on the acceptance of shared knowledge tools. In other words, active correspondence can be crucial for the usage of the tool. Also the increasing amount of different tools may have an effect on the usage of social media tools and how well they can be integrated together, e.g. the compatibility of the tools.

Nature of the tool ownership and adoption environment can effect on the adoption process of the new tools. Many new tools are adopted in informal settings, but may still have effects on other environments where the users may use their own tools. Technology adoption in informal settings may facilitate the bleed-over and merging of personal and work lives. There are more and more technologies to adopt and the adoption cycle is accelerating constantly. This may affect on future adoptions positively or negatively – there are contradictory research findings on this issue. Negative experiences of adoption may have a negative influence on future adoptions, and since there are more technologies and thereby more possibilities also for negative adoption experiences, one should be aware of the consequences. (Straub, 2009.)

We see technology selection and adoption to be a complex process. It contains elements of individual, social, contextual and technological factors. Since it seems impossible to be able to take them all into consideration at the same time, we suggest that appropriate perspectives should be highlighted more than others based on the specific goals of the situation.

ISBN 978-1-86220-283-2

WHAT MATTERS IN TECHNOLOGY SELECTION AND ADOPTION IN AVO AND AKTIIVI?

Development oriented, action theory based on-going project research in AKTIIVI and AVO supports the realization of the projects aims. Minor surveys and interviews of the project participants and target group have been realized when further information has been needed as a ground for development.
Two sub-studies were carried out in both projects concerning the technology mediated communication, and the results are presented in this section of the article. AVO study concentrates on the characteristics of technologies which make them appropriate for communication in a distributed network. AKTIIVI study concentrates on the adoption of new social media technologies in a distributed network.

Case AVO

In AVO, there was a need for a tool which could support everyday online communication between the geographically distributed project actors. A social media tool which can be defined as a combination of discussion forums and microblogging was taken in use in August 2010. It had to be switched to another tool twice. Two surveys were carried out based on the experiences of the users. The first survey was carried out three months after the first communication tool Flowdock had been taken in use and switched to Qaiku for Organisations. The second survey was carried out two months after Qaiku for Organisations had been taken in use and switched to Yammer. Some preliminary impressions were also asked about Yammer at the same time since it had been in use for a couple of weeks.

What kind of tool supports discussion and creation of a common virtual space?
If the tools that geographically distributed team uses are functional and enable interaction, they were seen as an equivalent option to the collocated way of working together. The features of the tool which is able to support communication and create a common virtual space were listed as follows:

- Supportive for different sensory or communication channels (auditory, visual). A tool which is based on only one channel will probably not be satisfying for everyone to create a feeling of presence. Numerous different tools were listed which project actors thought were best in creating closeness when actors were physically away from each other. There was a lot of variation depending on who preferred what kind of tool or tool combination.
- Simple, easy and convenient to use. The clarity of the application and user interface were seen to be important, so that the user knows how to post new messages and how to find comments for messages. Status updates were seen important, also like-button.
- Real time enough. The application should inform users about the new messages as soon as they are submitted.
- The tool must allow the user to follow the conversation chains backwards, also afterwards.
- The tool should be situated easily and naturally on one's own 'daily tool route'. Features like different interfaces (e.g. mobile, desktop application, browser interface, integrations to other systems) can support this feature.
- Equal in a way that the differences between users' abilities to use the tool will not be emphasized too much. Significance of the previous user experience was seen to ease the use of the application, but it could also cause inequality for the communication if some of the team members are experienced users of the application and others not.

There was variation within the tools tested in AVO what comes to the above mentioned features. All the tools allowed only textual communication and in this way were not supportive for different communication channels. When comparing the answers of open ended questions, Flowdock and Yammer were easy to use and seemed to support the purpose of communication quite well, they were also real time enough (e.g. messages appeared immediately after they were sent, announcements of the new messages): "In my opinion, Flowdock doesn't cause information noise.
Survey respondents were also asked if they felt the tools could help building a sense of presence, and according to the results between Flowdock and Qaiku for Organisations, it seemed that Flowdock was better in this – see figures 2 and 3 (no such figure of Yammer).

ISBN 978-1-86220-283-2

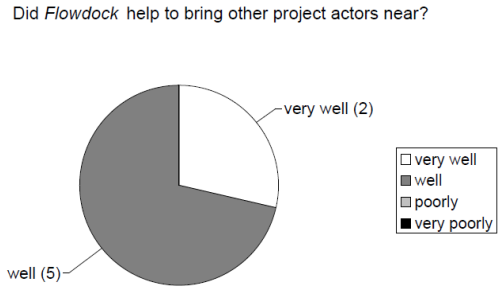

Figure 2. Flowdock's ability to build sense of presence.

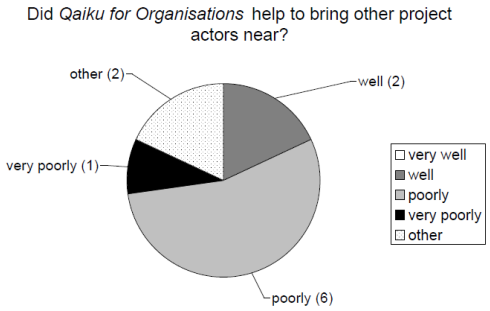

Figure 3. Qaiku for Organisation's ability to build sense of presence.

Other than technology related issues

According to the surveys, technology used was not seen to be the most important issue to create the feeling of presence when physically distributed. Familiarity of the project actors, being on the same wavelength and willingness to work together are seen to be important, also how much playfulness and humour is included in the communication. One should get response from the others after writing something on communication tool, so that the experience of presence is created: "There should be a reaction to the issues one communicates, preferably on the same working day. If not, you'll lose faith in the communication channel. If the reactions are even faster like few seconds, there is a sense of being present".

Face-to-face meetings were seen especially important for getting to know each other and for informal collaboration. The need for face-to-face meetings was seen to diminish after becoming acquainted with the others, if the technology mediated communication was fluent. The significance of face-to-face meetings was giving "a soul and body for virtual personalities" and also bringing recreation and variety for working remote from each other. There were also a few who felt it was quite natural to get to know others using web based communication tools and there was no need for face-to-face meetings.

Use context, situation and the goals of use seemed to matter when the technology selection was concerned, personal preferences also played a role. It seemed to be significant whether the activity was goal-oriented or if there were common efforts between the team members. Superficial co-working was seen to run smoothly using technology mediated communication. Also equal web based communication skills were seen important.

It was seen problematic that all the project actors don't use the communication tool. Actors felt there was an inner circle of active users, which was, on the other hand, seen to be better than no communication at all. Communication in AVO network using Qaiku for Organisations was seen to dry up because the project actors didn't find their way to the new tool after Flowdock. Because there was no-one present in Qaiku for Organisations, project actors didn't use it. Some respondents were afraid that taking Qaiku for Organisations in use had driven away those project actors who were only rarely present in Flowdock. One of the respondents brought up that s/he had tried to make the Qaiku for Organisations work out and activate the conversation: "And it was irritating when no one ever wrote anything."

Case AKTIIVI

AKTIIVI coordinating project encourages each of its projects to publish their ideas and results in the project blog to share them to each other. Research data concerning communication practices and usage of the different

ISBN 978-1-86220-283-2

communications tools by the participants has been collected during the years 2009-2010 in face-to-face meetings, project interviews and an online survey which was realized in autumn 2010 with 36 respondents. The survey contained mostly multiple choice questions, some open ended questions were also included. The focus of the survey was on studying the communication methods and attitudes towards knowledge sharing in the project network.
Even if the project participants were aware of the other projects' blogs or other communication channels, most of the information about the network was received through the AKTIIVI coordinating project's blogs and press releases. Almost every respondent considered project blogs, face-to-face meetings and e-mail as important tools in project communication. There was also variance with the communication methods inside the project. Approximately one third of the respondents were blogging or microblogging in regular basis. Facebook and Twitter were mentioned as the tools used.

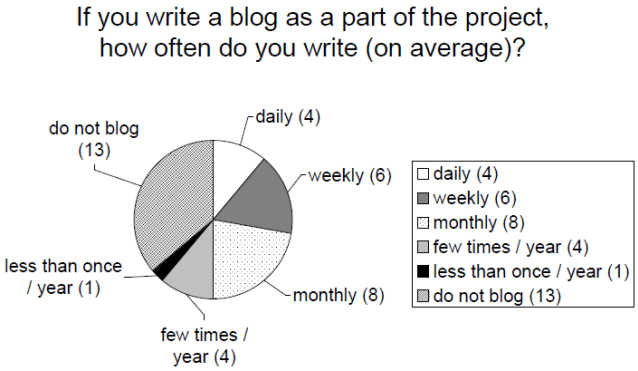

Figure 4. Project blog writing frequencies.

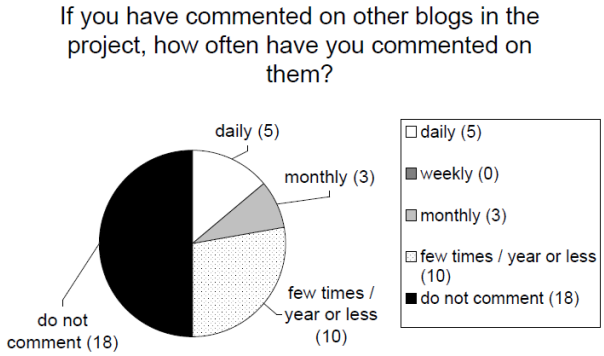

Figure 5. Project blog commentary frequencies.

Generally speaking, the communication in project network has been rather low. Respondents of the survey had very positive attitudes towards knowledge sharing and networking, but they also mentioned that it can be difficult in tight time-frame of the project and with limited staff. On the other hand the project members have expressed the need for dialogue and common themes, which were found in face-to-face meetings.
The issue may also be approached from technological viewpoint, especially adoption of technology. It is possible that the benefits of some social media tools such as microblogs have not been addressed well enough and communication benefits and codification efforts should be taken into stronger consideration in project network to overcome the time limit. Of course it requires time to learn to use new tools, but if they are easy to use and prove to be effective in sharing issues, they might be adopted. But with new technology like social media, it may also be a matter of new kind of communication culture and issues that the new tools bring out. For example, if only a couple of project actors use the tool, there is not much point for anyone to use it, since the basic function of social media tools is communication and sharing – just like in AVO case when Qaiku for Organisations was taken into use. Even though the AKTIIVI project blog has been widely adopted, it is used mainly for one-way communication, and project members hardly comment any other projects blogs.
Despite the strong role of AVO leading the use of social media among AKTIIVI network, other projects haven't

adopted the communication tools for their own use, even though actors of AVO have shared widely the experiences about how they use the tools, and also organized training. When seen from the viewpoint of technology adoption, role of the social worlds may be seen as a possible explanation. For example, the actors of AVO are more technologically savvy than the actors of AKTIIVI network in general. Actors of AVO are part of at least one social world which promotes the use of technology. They are themselves, or have contacts who are the first to know about new technologies. This will probably help the adoption of new technologies (see also Sivunen, 2007 and Mark & Poltrock, 2004). On the other hand, the actors of participatory projects in AKTIIVI are not necessarily connected to each other and this leads to consider the role of other than technology related factors which might need further addressing.

DISCUSSION

Our research contains systematic limitations because of the developmental nature of the activity in network. It is rather intuitive and new tools may be implemented without any planning. Research cases presented here are also part of a larger, constantly on-going action research, and the composition of the results presented here is a bit different than in more traditional research. The data has been collected mainly for projects' own developmental purposes and for example the research questions in our studies were not bound very tightly on the theoretical background presented here. We have selected interesting perceptions from our research and examined them through theories and previous research. However, this study brings out some new insights on issues which are not covered in existing research, like the characteristics of social media tools and their effect on technology adoption and acceptance.

Tools we have tested seem to have a lot in common with the tools tested in earlier studies referred (e.g. Instant Messaging and discussion forums). It seems that our results are in line with them in general level. For example, announcement about new message submission seems to be an important feature for a communication tool. Compared to our results, the features of an ideal technology for supporting knowledge sharing effectiveness by Majchrzak and Malhotra (2004), Cramton's ideals for distributed team's communication (2001) and properties which would support team identity building process by Sivunen (2007), we can conclude that Flowdock and Yammer have features that support these requirements at least partly.

Olson & Olson (2000) end up in somehow pessimistic conclusion in their study that collaborative work at a distance will remain difficult probably forever, even though there are technologies that will ease the work. They see as most difficult being able to overcome the locality and spatiality issues, and for example building trust which is seen important for a common ground in communication, seems to be difficult to engender. Their study is now 10 years old, and it looks like tools have developed in ten years so that it is possible to create some kind of virtual space for distributed teams.

The results may also be seen through technology adoption. AVO participants don't question the testing of new technologies and taking them into use seems to be quite easy. But the features of tested technologies have proved to be important for AVO participants according to our survey. The participants didn't want to stick in a technology which was difficult to use and which didn't support the purposes set. This supports the findings that experimentation and experience with a similar technology will facilitate the adoption process (Straub, 2009). But if we take into account the contrary research results that prior similar experience was negatively correlated with technology use, it would be possible that more advanced and technologically experienced users are able to adopt new technologies easily, but they are also able to conclude quickly if the new technology doesn't fit for their requirements and purposes. This may lead to nonadoption if adoption process is considered in a little longer time frame.

AKTIIVI participants do not easily step over the threshold of starting to use a new tool. This may be caused by any of the explanations concerning technology adoption, but also the nature of social media may have an influence. Social media seems to bring out new issues to prevent the adoption of technology, like publicity, privacy, dependency on other users and incompleteness of the contents. For example, when AVO users dispensed with using Qaiku for Organizations because of its problematic features, there was no point in using the tool for anyone, since there was no one to communicate with. Finally, many social media tools are not administered or owned by user's employee, and the possibility to get help from organization's help desk may not be possible. One must learn to find help from the networks. This seems to require new kind of mindset. Consequently, one must also find the networks.

Even though participants of AVO are actively using different technologies, it seems that the prerequisites for communication could be better in AVO, not to mention AKTIIVI which is even larger network and there is less communication between the participants than in AVO. Everyone is not participating in the communication and there are several communication channels which outline the communication only for some of the network

ISBN 978-1-86220-283-2

members. The actors are not communicating as much as possible about what they have learned and experienced in their own projects. This kind of communication would be very important for achieving a common view about the issues which are in focus of the project and which should be communicated further as the result of the project.

CONCLUSIONS

We found several references about the features which should be present in a tool which will support communication of a geographically distributed network: supportiveness for different sensory or communication channels, simple, easy and convenient to use, real time enough, possibility to follow the conversation chains backwards and afterwards, how easily and naturally the tool is situated on one's own 'daily tool route', and equality between users' abilities to use the tool.
We also found other features which are important prerequisites for communication in such a network. Familiarity of the project actors and willingness to work together, informal communication, occasional face-to-face meetings – especially in the beginning of the project etc., that everyone use the same communication tool, contextual and situational issues and personal preferences for different kind of tools were found to have be important or have an effect on the communication.
What comes to the social media based tools, we suggest that they bring new possibilities for communication, but also challenges for the technology adoption. This should be taken into account in technology adoption models and forthcoming research. It seems that the adoption process is more demanding for less advanced users who don't belong to networks of more advanced users. More advanced users seem to try new technologies quite easily and without an effort, but if the tools don't fit for their requirements and purposes, they may give up using them quickly.

References

Blanchard, A. & Markus, M. (2004). The experienced "sense" of a virtual community: characteristics and processes. The DATA BASE for Advances in Information Systems 35(1), 65–79.

Clark, H.E. & Brennan, S.E. (1991). Grounding in Communication. In L. Resnick, J.M. Levine & S.D. Teasley (Eds.) Perspectives on socially shared cognition, 127-149.

Cramton, C.D. (2001). The Mutual Knowledge Problem and Its Consequences for Dispersed Collaboration. Organization Science 12(3), 346-371. DOI= http://www.jstor.org/stable/3086013

Davis, F.D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly 13(3): 319–340.

Günther, O., Krasnova, H., Riehle, D., & Schöndienst, V. (2009). Modeling Microblogging Adoption in the Enterprise. 15th Americas Conference on Information Systems. Vol. 1, 1-10.

Majcharzak, A. & Malhotra, A. (2004). Virtual Workspace Technology Use and Knowledge-Sharing Effectiveness in Distributed Teams: The Influence of a Team's Transactive Memory. In: Knowledge Management Knowledge Base, Online publication. DOI= http://oz.stern.nyu.edu/seminar/0928.pdf

Mark, G. & Poltrock, S. (2004). Groupware adoption in a distributed organization: transporting and transforming technology through social worlds. Information and Organization 14, 297-327.

McMillan, D.W. & Chavis, D.M. (1986). Sense of Community: A Definition and Theory. Journal of Community Psychology 14, 6-23.

Olson, G.M. & Olson, J.S. (2000). Distance Matters. Human-Computer Interaction 15, 139-178.

Peters, L.M. & Manz, C.C. (2007). Identifying antecedents of virtual team collaboration. Team Performance Management 13(3/4), 117-129.

Sivunen, A. (2007). Vuorovaikutus, viestintäteknologia ja identifioituminen hajautetuissa tiimeissä. Jyväskylä Studies in Humanities 79. Jyväskylä: Jyväskylän yliopisto.

Straub, E.T. (2009). Understanding Technology Adoption: Theory and Future Directions for Informal Learning. Review of Educational Research 79(2), 625-649.

Venkatesh, V., Morris, M.G., Davis, G.B., & Davis, F.D. (2003). User Acceptance of Information Technology: Toward a Unified View, MIS Quarterly, 27, 3, 425-478.

Wellman, B. (2001). The Persistence and Transformation of Community: From Neighborhood Groups to Social Networks. Report to the Law Commission of Canada. Wellman Associates, October 30, 2001.

Wellman, B. & Leighton, B. (1979). Networks, Neighborhoods, and Communities. Approaches to the Study of the Community Question. Urban Affairs Quarterly, 14(3), 363-390.