u^b

_b_
**UNIVERSITÄT
BERN**

Institute of Information Systems

University of Bern

Working Paper No. 226

USING MICROBLOGGING IN A WORK PLACE CONTEXT

Paul Meyer

Paul Swatman

Jens Dibbern

September 2009

Address: Engehaldenstrasse 8, CH-3012 Bern, Switzerland
Phone: +41 (0)31 631 31 70
E-Mail: paul.meyer@iwi.unibe.ch

Address: School of Computer and Information Science, University of South Australia, 27-29 North Terrace, 5000 Adelaide, Australia
E-Mail: paul.swatman@unisa.edu.au

Address: Engehaldenstrasse 8, CH-3012 Bern, Switzerland
E-Mail: jens.dibbern@iwi.unibe.ch

USING MICROBLOGGING IN A WORK PLACE CONTEXT

Abstract

Twitter is the new Web 2.0 hype in the media. Techies, politicians, family members and many more use Twitter to keep in touch with their interest groups, their voters or their beloved ones. Drawing on Computer Supported Work Research, we ask what Twitter can achieve for us at the work place. On the premise that Twitter supports awareness of others we investigate how awareness in a team can be improved by Twitter such to increase team performance. Probing Twitter in a team of seven researchers, we find that Twitter is used much differently in an organisational setting than one might expect from the experiences in recreational settings. Indeed our results confirm that Twitter-mediated awareness can positively influence group performance. However, awareness information is only conveyed if users are motivated to post status updates. To our suprise extrinsic incentives play a much greater role for using Twitter than we would assume from leisure use of the system. Furthermore, we find that usage is facilitated by various conditions. Our results suggest that both the motivation to use Twitter as well as Twitter-enhanced group performance are critically dependent on two contengencies: task interdependence and task similarity.

Keywords: awareness, Twitter, microblogging, informal communication, teamwork, computer supported cooperative work (CSCW), computer-mediated communication (CMC).

1   INTRODUCTION

To date, we experience a proliferation of new Web 2.0 tools with a great deal of them offering now functions for updating the user`s status. One of the best-known and most successful tools for this phenomenon called microblogging is Twitter. Typically, a Twitter message answers the question "What are you doing?"; but any possible textual content can be sent unless it does not exceed 140 characters. The messages are received by any user that subscribes to the particular microblog and can be viewed via a website, instant messenger-like clients, cell phone or email. Thus –similar to other Web 2.0 applications– Twitter does not impose any structure. Users are free to decide which messages they want to receive and can organise themselves in self-changing networks. In such networks, each user has – in the same way as within a blog – a personal webpage displaying a history of his last updates.

Next to Twitter, many other platforms like Facebook and Skype have implemented functions for sending status updates and viewing the updates of other users. Generally, the implemented functions provide the users with small messages that support an "understanding of the activities of others, which provides a context for your own activity"; which is referred to as *awareness* (Dourish and Bellotti, 1992). Therefore, as researchers we are interested in the support of awareness and its impacts rather than in the particular tools themselves.

Like with other Web 2.0 applications, many users not only use these "awareness" tools in their private lives, but also in their work context. Increasingly, Twitter is seen to have benefits when used in teams at work (Günther, Krasnova, Riehle and Schöndienst, 2009). Generally, awareness of the team members can be considered as a prerequisite for creating a shared work context for improving coordination (Liang, Moreland and Argote, 1995) and as a starting point for informal, social interactions (Cramton, 2001), which in turn is a premise for sharing tacit knowledge in teams.

Nonetheless, companies fear that Web 2.0 software may rather distract workers than rendering teamwork more effective (Shumarova and Swatman, 2008) –and so is the case with Facebook, Twitter, Skype and Co. Already millions of people are posting messages such as "drinking a coffee" or "had a nice cake –hmm, yummy!" on a daily basis. Java et al. (2007) identified daily chatter, conversations using the direct messaging function, sharing information as well as URLs and reporting news from agents or so-called news bots as the prevalent categories. Günther et al. (2009) are the first to investigate microblogging in organisations. In a focus group session, they discovered that relative advantage (e.g. improved communication), signal-to-noise, cost of time, privacy concerns and organisational culure may be of particular importance for the acceptance of microblogging. In addition, extrinsic incentives, distance between users and ease of use are mentioned in the focus group session, however, they are allotted low importance (Günther et al., 2009).

Beyond asking whether microblogging will be accepted in an enterprise, we investigate whether there is a link between these messages (i.e. Twitter usage) and performance in a team mediated by awareness. Hence, in terms of awareness we pose the question:

How can Twitter improve awareness and thus effectiveness in teams?

For answering this question, we examined Twitter usage in a working team during a period of three weeks.

2   RESEARCH APPROACH

2.1   Research Method

A team of seven researchers –among them two of the authors– agreed to adopt Twitter, as one of their communication channels over a period of three weeks. The team consisted of the Professor (second author), three PhD students (two of them lecturers) and three master students (one of them the first author). The core of the team had been working together on different research projects for more than three years; all test participants had worked for at least four months in the team. The team was therefore fully established – team members were professionally experienced, both individually and as a group; and the team was socially well integrated. Like most research groups, in addition to undertaking research, they also needed to attend to the ongoing task of finding research sponsors and of building the research team itself. Free of any constraints the team members were able to use Twitter to support any of their tasks.

Frequent use of the Twitter site for writing and reading tweets was found to be very cumbersome. Therefore the team members had a client called Twhirl (Seesmic, 2008) configured to launch on PC start-up running in the background. Instead of loading up the Twitter site and logging in, once the user's credentials have been presented, the Twhirl client remains always logged in; it can be activated simply by clicking on its taskbar icon.

We gathered data in different ways. First, we wrote down our own observations which allowed us to assess participants' communications with others, and what was actually done – not what is said to be done (Kendall and Kendall, 2002). Second, evidence about the communication between participants was gathered by conducting a content analysis of the messages sent via Twitter. As the researchers were part of the study the risk that they could bias the participants when gathering data was especially high. Therefore, one of the researchers also took on the role of an external observer conducting interviews in a structured way. Initially, the participants were asked to fill out online surveys. Since the questionnaires were filled out anonymously data was less likely to be biased by the researcher (Gray, 2004). Based on the questionnaire data, we conducted follow-up interviews to explore the perceptions of Twitter usage in a team by each individual participant. In the research findings the results from each of theses separate empirical assessments are presented and then synthesized.

3   RESEARCH FINDINGS

3.1   Observations

3.1.1   Evolution of Twitter Messages

In the first few days not many tweets were posted, and the information content of the messages was relatively low. Typically the messages were about a person's whereabouts and which document he/she was working on:

> *Participant E: I am working on my thesis again tonight.*

> *Participant K: Is working on the paper.*

> *Participant A: out for coffee.*

It was noted that, generally, users began to provide more in-depth information of status. Rather than stating merely that they were doing 'something' on their research projects, they began to describe which particular research field they were studying or which problems they were recently experiencing in their work:

> *Participant G: Writing something on Knowledge-Sharing Projects in FPOs and NPOs*

> *Participant E: I have been working on my thesis - I am worried about the testing components - but will get advice tomorrow.*

Besides talking about where they where and what they were doing, team members also began to ask questions about what had to be done next, to share information in the form of URLs or to send messages about non-task related topics:

> *Participant D: (name of participant B), Rikki is happy to meet me in Second Life on Thursday for our regular project meeting. Do you want us to tweet each other before we go in?*

> *Participant A: endnote is extremely slow with word 2007 - does anyone know a solution for this?*

> *Participant A: the new word 2007 shortcuts: http://tinyurl.com/3bdrgj*

> *Participant C.: Met a big grey kangaroo on the driveway this morning as I walked back home with the newspaper. A small one was sunning itself on our front verandah...*

Increasingly, people began adding a personal touch to their messages, by commenting on other participants' tweets or uttering their personal feelings about issues they encountered during their work day.

> *Participant D: I'm still waiting for Second Life. The IT helpless people still need to push another button and can't do it till later this afternoon. So tricky...*

> *Participant G: is still working hard on the Knowledge Sharing paper. It's fun to do this on a Friday evening :)*

The latter message in particular indicates that Twitter was also used by the participants to signalise to the Professor that effort was being made to get tasks done. Members also took advantage of the fact that all tweets come with a timestamp: for example, some team members would send a "leaving the office" when going home late at night, to demonstrate their after-hours work effort.

Participants had not been required to have the automatic nudging function activated and were free to twitter when and what they wanted; but some participants preferred to have the nudging function sending them an automatic reminder message.

3.1.2   Impacts on Teamwork

We observed various situations were Twitter proved itself to be of benefit. We can group these situations according to their impacts on teamwork:

- **Facilitation and coordination of transitions between individual and shared work**. Participants occasionally used Twitter to organise ad-hoc team meetings. These meetings mostly had an informal and voluntary character, like having a time-off for a coffee or meeting one-on-one for discussing an urgent issue.

- **Enhancement of coordination of actions.** It is suited to micro-coordination, such as the delegation of tasks. For macro-coordination activities like goal-setting, Twitter was not used, but status updates gave insight into current tasks, intentions and work rhythms of colleagues. The team was always informed what the Professor was working on, which also gave a good insight on whether one should disturb him and ask a question or rather not. Also for example a

team member would post that he was far from finishing a part of a paper in order to inform his team mates that it would not make sense to meet the same day.

- **Promotion of social interaction.** Like instant messaging, Twitter was extensively used for informal communication, either as group messages to the whole team or direct messages to one single person. Equally important was the fact that status updates provide a context for making contact with others. Twitter provided group members with information about the others' backgrounds, current information about their work and a variety topics that can serve as starting points for a conversation.

- **Promotion of sharing of tacit and explicit knowledge.** Status updates kept participants aware of opportunities to assist each other or share information. In addition, spontaneous sharing of information in the form of short headlines about task-related news or URLs to other documents have potential.

3.2   Content analysis

The content categories found in the Twitter study by Java et al. (2007) make sense within open communities. We however probe Twitter in the context of a closed team and more abstractly, we try to investigate how Twitter would be used to support group awareness. Therefore our coding scheme is derived from the four awareness categories identified by Weisband (2002): availability awareness, activity awareness, process awareness, social awareness and the category sharing information/URLs, which was added as an important content category identified in the context of Twitter by Java et al. (2007). How the coding scheme was applied to sample Twitter posts is illustrated in Table 1:

Coding Scheme
Activity awareness. All information about activities directly associated with the group's task – namely, to carry out research.
Participant G: is doing his literature review of the importance of Creativity in the HCI community.
Availability awareness. All insights that aid other users to see whether the person is available for a meeting. In contrast with activity awareness, this kind of information is not directly related to the team's task.
Participant A: is off for a coffee - back in 20 mins
Process awareness. All information about what has to be done, who has to do it and when it has to be done. In particular, information about where, when and with whom to have a meeting.
Participant B: hi everybody, the Second Life meeting will take place in about 10 min.
Participant E: I haven't forgotten about the PP slides and will send them hopefully tomorrow
Social awareness. All information that is not related to the task itself, but serves to socialise with team members.
Participant A: Whoever laughs, has free resources.
Participant C: Met a big grey kangaroo on the driveway this morning as I walked back home with the newspaper.

> **Sharing information/URLs**. All knowledge shared in form of URLs, ideas or news about recent events.

> Participant A: endnote is extremely slow with word 2007 - does anyone know a solution for this?

> Participant B: have a look at why second life makes or does not make sense in companies: http://is.gd/2wco

Table 1: Coding Scheme

Many tweets can be assigned to more than one category. For example, the first part of the following message describes what the team member is doing (activity awareness), whereas the last sentence was written to inform the other team members about what the person is going to do (process awareness):

> Participant E*: I am working on my thesis tonight - I will send (name of participant C) something in the way of PPoints etc as soon as I get a chance.*

Another example is the combination of a phrase that could be assigned to social awareness and a sentence clearly describing the user's activity:

> Participant B*: had dinner at eros:very tasty but expensive! creating a survey at home now.*

For reasons of simplicity and, more importantly, to guarantee an unequivocal assignment of coding blocks to the distinct categories, sentences were defined as the basic units of analysis. Accordingly, the coding scheme classifies the message of participant E as activity and process awareness and the tweet of participant B as social and activity awareness.
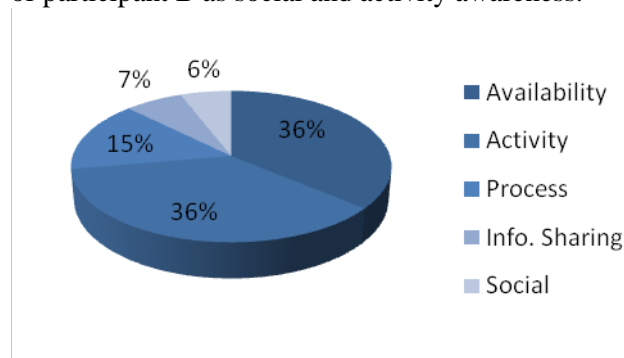

Figure 1: Information Content

In total, 222 tweets or 260 sentences were posted by the users; Figure 1 above illustrates the share of every content category in the total number of sentences posted and can be regarded as the typical "Twitter pattern". It becomes evident that information about availability and activity was the most sent content; most users combined the two categories in one tweet (cf Table 1). The third-most important category was process awareness; while sharing information and social awareness played a minor role.

A closer look at the messages in each content category reveals: To provide awareness of their activities, the participants mainly gave updates about their theses documents, presentations, scientific papers or the development status of prototype software. Availability awareness mostly included whether or not a team-member was in the office, at a client's or at home, and through which channels (e.g., email, cell 'phone, Twitter) the person was reachable. The third-most important category, process awareness, mainly embraced the questions what had to be done and when for projects of the chair, or which paper or thesis draft had to be handed in to the Professor, and when. Information was shared mostly by sending links to papers or newspaper articles and commenting on these. Social awareness included all kinds of topics related to the team members' personal backgrounds, but also compliments on others' work. Although the share of social awareness is relatively small, it should be

noted that the content analysis does not refute the fact that Twitter is a very informal and spontaneous medium: on the contrary, our observations– that the majority of status updates were very informal and had a personal touch – were confirmed when reading the messages and coding them.

Variations from the content pattern depicted in Figure 2 only occurred in special cases. Participant E that worked remotely was using Twitter much more often for requesting process awareness (60% share on overall content). This participant very often send messages to inquire what was going on at the office in terms of what the group is doing next and what that meant for him. In addition, the Professor posted slightly more messages (20% share on overall content) informing the others of what should be done next and who should do which task.

3.3   Questionnaire and Follow-up Interviews

3.3.1   Motivation

In the interviews, all participants stated that when using Twitter extrinsic incentives overweight intrinsic incentives. The extrinsic incentives to read others' Twitter messages were:

1) the need to know about team-member activities and availability, particularly when a person was dependent on another team–member's work, and

2) to be up-to-date about recent news and developments related to the team task.

Extrinsic incentives to send a message included the need

3) to show that effort was made,

4) to get positive feedback from team-members when a task was successfully accomplished, or

5) for assistance on a specific task from another team-member.

Intrinsic incentives to use Twitter included a benevolent attitude towards

6) helping others,

7) supporting them by praising their work, and

8) learning from other members of the team.

3.3.2   Relevance

Two factors emerged from the interviews that increase the relevance of Twitter messages, or, in other terms, reduce information overloading. In the first place, participants that were working closely together such that the completion of their tasks was directly dependent on others were more likely to read Twitter messages of the persons s/he was relying on. Thus, **task interdependence** is one factor that positively influences the relevance of messages and thus increases the probability that they are read.

In addition, participants who were working on similar tasks were reading each other's Twitter messages more regularly. Twitter was used to find out whether another person is working on the same topic and, if so, to track how the person is progressing. We thus identified **task similarity** as a second factor that influences the relevance of information sent via Twitter. The right part of *Table 2* visualises for each team member with which other person s/he was in a relationship characterised by high task interdependence or high task similarity. The table shows, for instance, for participant A, that high task interdependency with C and G as well as high task similarity with B and G is associated with high levels of motivation of participant A to read Twitter messages as well as to send Twitter messages.

Participant	Time Scarcity	Extraversion	High Task Interference with	High Task Similarity with	Motivation to read other messages	Messages sent
A (Master)	Low	High	C, G	B, G	High	82
B (Master)	Low	Normal	C	A, G	High	66
C (Prof)	High	Normal	-	D, F	High	18
G (PhD)	Low	Normal	C, A	A	High	11
D (Lecturer)	High	Normal	C	C	Low	18
E (Master)	Low	Normal	C	-	Low	16
F (Lecturer)	High	Low	C	C	Low	11

Table 2: Twitter messages per person with regard to time scarcity, mobility, task interdependence and task similarity

Generally, all participants were dependent in their tasks on the advices and directions of the Professor, which is why his messages had the highest relevance. Participant A and B –the master students– encountered very similar problems when beginning to writing down research (high task similarity), wherefore they stated in the interviews that they were reading each other's Twitter messages. Trying to learn from the more experienced members of the team, both of them were paying attention to the posts of the PhD student (participant G). One of them (participant A) even found out via Twitter, that the PhD student (participant G) was currently writing a paper about his topic and thus began working more closely with him. Hence, it can happen that participants that discover that they are working on the same task begin to divide work among each other such that their tasks also become interdependent. The Professor, on the other hand, was mainly occupied with leading the team as a whole. To him all participants were equally important. Nonetheless, he had quite similar tasks with the other lecturers. In contrast to this, participant E was not working on a very similar task or dependent on the others with the exception of being dependent on the Professor. Therefore, he was mainly interested in the availability and activity of the Professor and therefore considered the messages of the others as unnecessary.

Table 2 shows the link between task interdependence as well as task similarity within the group. The more group members depended on a person, and/or that person depended on others and the more similar the person's task were with another person's tasks the higher was the motivation to read Twitter messages as stated by the participants in the interviews. And if we compare this with the messages posted, we also see that participants with high task interdependence and high task similarity send more messages than their peers with low levels of task interdependence and high task similarity.

The interviews also yielded that people that were highly dependent on somebody, preferred to receive that person`s messages in real time, whereas team members that were working on similar tasks did not need to be procured with each others messages in a real time manner, rather it seemed sufficient if such messages are received only once a day.

The questionnaire and the interviews confirmed that Twitter was easy to use and that they would expect other people to learn using the software quickly. We therefore asked what other barriers there were that prevented the participants from using the system.

In *Table 2* we see that time scarcity and extraversion might be barriers to use the system. The main barrier to reading and sending tweets was mainly **lack of time** when people were stressed and were facing a heavy workload. One participant said that he would even switch off Twitter on stressy days.

A barrier found to prevent users from sending Twitter messages was **extroversion** of users. Most of the group members did not think they were neither very extroverted nor very introverted. However, participant A who sent the most messages and stated that he was a very extroverted person. On the other hand, participant G indicated to be rather introverted and we see that he sent the least messages among all group members (see also Table 2). But he also said that the technology would help him to get more information about people than usual:

> *What people are doing with their work. Basically, I am a shy person, so I do not go around asking people what they are doing... So by twittering you actually get information about what is happening or what other people want to know others that they are doing..... it is interesting to know what people are doing.*

4   RESUMEE AND IMPLICATIONS OF FINDINGS

In the beginning, the problem with Twitter was not to understand how to Twitter, but rather what to Twitter. Within the relatively short time of three weeks we observed a fast evolution of Twitter messages suggesting that users learned to better use Twitter in order to maximise its utility. We cannot track the impact of this evolution on overall group performance. Nonetheless, we find evidence that the awareness leveraged via Twitter has not only positive effects on knowledge sharing in the team (Günther et al., 2009), but also on social interaction, coordination and management of transitions between individual and shared work.

The content analysis showed how Twitter can be used to enhance availability, activity, process and social awareness and sharing information. With respect to these five content classifications, we observe that availability awareness, activity awareness and process awareness play a much more important role than social awareness and sharing information. Distance and group leadership may influence Twitter behaviour. Distant users post much more process awareness messages than non-distant users. Group leader like the Professor have a higher need to inform other group members about the processes in the group.

Contrary to what the focus group sessions of Günther, Krasnova et al. (2009) suggest we find that extrinsic incentives play a much more important role for motivating users to use Twitter. Actually, extrinsic incentives (like e.g. showing that effort was made) were reported the main drivers; intrinsic on the other hand were not perceived as so important. We also see that the power structure in the group had significant impact on motivation. This is again mirrored in the task interdependence variable. People dependent on other group members were more likely to read that person's tweets and post updates. Privacy concerns did not turn out to be an important issue as Twitter users can decide on their own what kind of information they want to post in a Twitter message.

On the other hand, the findings also confirm and further illustrate some of the results of Günther, Krasnova et al. (2009). We confirm that relative advantage and perceived usefulness are very important for the acceptance of Twitter. In addition, the relevance or signal-to-noise ratio of Twitter messages is influenced by task similarity and task interdependence. This shows that relational attributes of group members play an important role for understanding Twitter-mediated group performance. Other factors that were found to matter are the context of Twitter usage as well as

personal attributes of individual tealm members. For example, cost of time or lack of time is confirmed to be an aggravating contextual condition for using Twitter. Moreover, we add that extroversion of users is a personal condition to be fulfilled in order to achieve user acceptance.

To sum up, our findings can be illustrated in the model depicted in Figure 2. In the interviews we found that the more relationships a participant has with other users, that can be characterised by a high level of task interdependence and/or similarity, the more relevant that participant would rate the Twitter messages received. Thus, the motivation to use Twitter was higher. A higher motivation resulted in more usage of Twitter, i.e. the participant would also send more messages. The content analysis showed that Twitter was indeed used for enhancing awareness. Our observations indicated that the increased awareness has positive effects on group performance (e.g. by improving coordination).
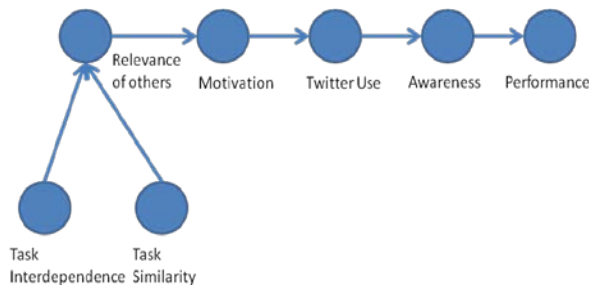

Figure 2

5   CONCLUSION AND FUTURE WORK

Twitter usage in an organisational context is much different from what studies about recreational Twitter use suggest (e.g. (Java et al., 2007)). Generally, we cannot confirm that Twitter is a tool that would encourage social loafing in organizations, but – as awareness literature suggests – even enhances collaboration in multiple ways.

Although the Twitter use in leisure time might suggest that intrinsic incentives are a prevalent trigger for sending and receiving awareness information, the findings showed that team members face intrinsic as well as extrinsic incentives when providing awareness about their actions and activities to the group. At work extrinsic incentives play a much more important role than intrinsic incentives.

In line with the extrinsic motivation, users are very rational when deciding what awareness information to receive/read and to send to their co-workers. Moreover, we identify two factors that decide over the relevance of awareness information: task interdependence and task similarity. In a model we depict the links between relevance of information twittered, motivation and Twitter use and group performance.

The major limitation of our study is that the full impact of motivational incentives could not be observed, because we did not analyse the user motivation with respect to networking effects – the time was too limited and the number of test participants could not change during the test period. Högg et al. state that networking effects have significant impact on the interplay of intrinsic and extrinsic motivation in Web 2.0 communities in fact, they affirm that the intrinsic value of such communities is very limited, whereas the extrinsic value increases over time with the number of user interactions. As more content is generated and more users join the community, the value for the users increases. The bottom line for Twitter and similar communities is that this mechanism is not initially formulated, but emerges and is amplified over time (Högg, Meckel, Stanoevska-Slabeva, Martignoni and digitale Forschungsplattform, 2006).

Further research in our opinion should be done about distributed teams using Twitter. In our research setting all but one participant were collocated. When team-members are in the same office, they can observe what others are doing by going around and watching their co-workers; so it is also possible to gather information about the team without initiating interactions with them and thus without distracting them from work (Kraut, Fussell, Brennan and Siegel, 2002). Whereas in collocated settings team members can easily monitor and display awareness information, like current task status and each other's capabilities, in a timely manner, awareness literature suggests that maintaining awareness of the circumstances and events relevant to the group is particularly difficult in distributed teams (Cramton, 2001; Gutwin and Greenberg, 2004). We therefore hypothesise that using Twitter to enhance awareness in a distributed setting would even have greater impact on group performance.

Cramton, C. D. (2001) *The Mutual Knowledge Problem and Its Consequences for Dispersed Collaboration,* Organization Science*, 12 (3), pp. 346-371.

Dourish, P. and Bellotti, V. (1992) *Awareness and coordination in shared workspaces*, Proceedings of the Conference on Computer-Supported Cooperative Work ACM, Toronto, Ont, Can, pp. 107-114.

Gray, D. E. (2004) *Doing Research in the Real World,* Sage Publications Inc, Thousand Oaks, CA.

Günther, O., Krasnova, H., Riehle, D. and Schöndienst, V. (2009) *Modeling Microblogging Adoption in the Enterprise*, AMCIS 2009 Proceedings, pp. Paper 544.

Gutwin, C. and Greenberg, S. (2004) *The Importance of Awareness for Team Cognition in Distributed Collaboration,* Team Cognition: Understanding the Factors that Drive Process and Performance*, 201 177-201.

Högg, R., Meckel, M., Stanoevska-Slabeva, K., Martignoni, R. and digitale Forschungsplattform, A. D. (2006) *Overview of business models for Web 2.0 communities*, Proceedings of GeNeMe, Dresden, pp. 23-37.

Java, A., Song, X., Finin, T. and Tseng, B. (2007) *Why we twitter: understanding microblogging usage and communities,* Proceedings of the Joint 9th WebKDD and 1st SNA-KDD 2007 workshop on Web mining and social network analysis*, 56-65.

Kendall, K. E. and Kendall, J. E. (2002) *Systems Analysis and Design,* Prentice-Hall, Inc., New Jersey.

Kraut, R. E., Fussell, S. R., Brennan, S. E. and Siegel, J. (2002) *Understanding effects of proximity on collaboration: Implications for technologies to support remote collaborative work,* In Distributed Work(Eds, Hinds, P. J. and Kiesler, S.) The MIT Press, Cambridge, MA, pp. 137-162.

Liang, D. W., Moreland, R. and Argote, L. (1995) *Group Versus Individual Training and Group Performance: The Mediating Role of Transactive Memory,* Personality and Social Psychology Bulletin*, 21 (4), pp. 384.

Seesmic, I. (2008) *the social software client*, Vol. 2008.

Shumarova, E. and Swatman, P. A. (2008) *'Informal eCollaboration Channels: Shedding Light on "Shadow CIT"'*, 21st Bled eConference eCollaboration: Overcoming Boundaries Through Multi-Channel Interaction, Bled, Slovenia, June 15 - 18.

Weisband, S. (2002) *Maintaining awareness in distributed team collaboration: Implications for leadership and performance,* In Distributed WorkMIT Press, Cambridge, MA, pp. 311-333.