Designing Rooms for Virtual, Informal Communication:

Reciprocal Awareness as a Central Criterion

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"You See Me, When I Also See You"

- Reciprocal Awareness as a Design Criterion for Rooms Providing Virtual, Informal Communication, using a Virtual Café as an Example.

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Abstract

The trend towards decentralized collaboration in companies leads to challenges for informal communication because spatial proximity is missing. This is a problem since informal communication is considered to be key for successful collaboration. Telepresence systems, which connect distant places, are potential solutions. However, little is known about which conditions are beneficial and which ones detrimental to informal communication. In this qualitative study, conditions which further informal communication, were examined in different virtual café settings. A method was developed which combined participatory design with a qualitative experiment. In the Usability Lab of the University of Arts and Sciences Northwestern Switzerland (FHNW), 19 people (N 19) tried out various virtual café settings, analyzed requirements for optimization and subsequently tested them. At the same time, 20 group interviews were conducted and analyzed according to the principles of heuristic-detecting social research. Three subcategories which influence each other were identified as key results (awareness, privacy and control). These three subcategories need to be balanced when a virtual café (room and technology) is designed. Furthermore, encouraging (reciprocal) awareness could also be a possible solution.

Keywords

Digitization • Informal communication • Participatory design • Qualitative experiment • Reciprocal awareness • Decentralized communication • Decentralized cooperation • Virtual communication • Computer-mediated communication

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1 Introduction

According to Hrastinski (2010), informal communication is a key success factor for company performance. Between 80 and 90 % of all interpersonal interaction in the work place is informal (Kraut et al. 1990) and deals mostly with work related topics (von Bismarck et al. 1999b). Pentland's (2012) study outcomes show that cross-sector informal communication is recognized a key criterion for team performance. It is a significant factor which conveys organizational culture and knowledge and also encourages the loyalty and good will of employees (Fish et al. 1993). Kraut et al. (1990) as well as Coradi and Boutellier (2013) substantiate a clear connection between spatial proximity and the frequency of interaction. However, due to the ever expanding globalization, the trend towards decentralized collaboration is impeding the important factor for informal communication, spatial proximity (Schulze et al. 2014). The economic relevance of this impeded informal communication is shown by the fact that already in 2008, 47 % of the 4.8 million people in the Swiss workforce worked in companies with decentralized locations, and this trend is still rising (Brändle et al. 2010). In order to compensate for this decentralized distance, organizations have been forced to support their cooperative processes through cost-intense, internet-based media (e.g. Telepresence systems[1]) (Rack et al. 2011). The disadvantage is that such systems usually support the formal aspects of collaboration and not the informal ones (von Bismarck et al. 1999a).

Using technical media to satisfy the demands of informal communication in decentralized settings is challenging and, at the same time, solution potential. The use of audio- and video technologies to permanently connect geographically separate places can potentially solve the dilemma between the trend to cross-company, virtual cooperation and the importance of informal communication. The research project, "The Development and Implementation of Places for Virtual, Informal Communication (OviK[2])", also deals with this topic which will be described in more detail in the following section.

2 Research Project "The Development and Implementation of Places for Virtual, Informal Communication (OviK)"

In this section, the overall project OviK will be presented. The current study, a sub-project of OviK, is explained in Sect. 3 and the following.

[1] Alternatively video transmission systems.

[2] The abbreviation for Places of Virtual, Informal Communication.

2.1 Project Description

OviK is a research project promoted by the Swiss Commission for Technology and Innovation (KTI) and by industrial partners (application partners). This project has run for 2 years and ended in November, 2016.

The project looked at how and under which conditions informal, virtual communication can be established or promoted among a company's different sites. Therefore, the application partners (see Sect. 2.3) set up a "room for virtual, informal communication" in two different sites of individual companies. In the pilot phase, the practical usage of the OviKs were introduced, tested, evaluated and optimized through an iterative developmental process (modifications included).

Before the begin of the project's pilot phase, inspections, interviews, diary studies, and observations (see Sect. 2.3) at companies of the application partners were conducted to assess the needs and to differentiate and define the demands on the OviKs. With this information, the first initial settings or rather, pilot scenarios (see Sect. 2.1.1ff.) were conceptually devised and prototypes developed.

In the following the various pilot scenarios will be briefly described. The three developed conceptual pilot scenarios were based on complex combinations of the aspects *motion*, *encounter possibilities* and *intimacy*, each of which was weighted differently in each case.

2.1.1 Pilot Scenario "OviK - Virtual Piazza"

The "OviK - Virtual Piazza" (see Fig. 1) is similar to a public place with the strong aspect of *motion* and transience, or rather they are transient places to linger with limited proximity. Such a place can be, for example, an entrance hall or transit area in organizations or companies with a welcoming- or lingering-areas. Such areas are being continuously expanded into places for informal encounters.

Fig. 1 Illustration of a Virtual Piazza, © CCTP Competence Centre for Typology and Planning in Architecture, 2015.

2.1.2 Pilot Scenario "OviK - Virtual Extended Office"

The "OviK - Virtual Extended Office" (see Fig. 2) is a shared room for a group of employees who work and communicate virtually and decentralized (e.g. project work). Colleagues in the one place are meant to work with their colleagues in the other place as if they all sat together in the same room.

Fig. 2 Illustration of a Virtual Extended Office, © CCTP Competence Centre for Typology and Planning in Architecture, 2015.

2.1.3 Pilot Scenario "OviK - Virtual Café"

The "OviK - Virtual Café (See Fig. 3) is a semi-public room to increase the chance of serendipitous informal cross-company encounters. This is in contrast to the more formal video conferences. In addition, it is legitimized through a socially accepted attractor (cafeteria). Places where employees can relax, such as a cafeteria or something similar, can be used in this way.

The current study focuses on this pilot scenario "OviK-Virtual Café" (see Sect. 3ff.).

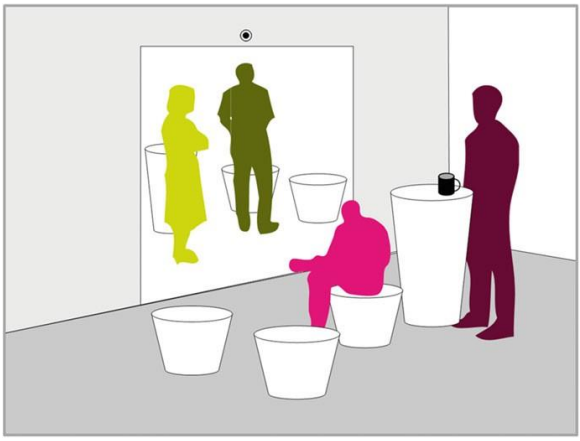

Fig. 3 Illustration of a Virtual Café, © CCTP Competence Centre for Typology and Planning in Architecture, 2015.

2.2 Project Goals

A central goal of the whole project is the initial development and testing of OviKs to promote informal virtual communication between geographically separate sites. The OviKs should have coordinated furnishings and video communication technologies. A further goal was to have the different companies and the application partners implement and use the developed OviKs throughout the project. Based on project experience, progress reports were written explaining the necessary requirements of informal, virtual communication.

After the project's end, a descriptive model of the evaluated OviKs is going to be conceptualised that will contain the relevant data and the parameters for design and equipment. In addition, an advisory concept for the *implementation*, *introduction* and *operation* of OviKs is planned.

2.3 Project Members

Several research partners participated in this project: the Institute for the Research and Development of Collaborative Processes (ifk) from the School of Applied Psychology and the Institute of Experimental Design and Media Cultures (IXDM) from the Academy of Art and Design, which are both parts of the University of Applied Sciences and Arts Northwest Switzerland (FHNW). Prof. Dr. Hartmut Schulze (Institute Director ifk) was the project manager and Andreas Simon (member of IXDM) the co-project manager. A further research partner was the Competence Centre for Typology and Planning in Architecture (CCTP), which is a part of the Lucerne University of Applied Sciences and Arts - the Lucerne School of Engineering and Architecture. These research partners were primarily responsible for the development and evaluation of the OviKs in close consultation with their implementation partners who were Vitra AG (home and office furnishings), Cisco Systems (Switzerland) GmbH (IT/Telecommunication). They provided the various video technologies and also the design components and furniture to develop the OviKs. In addition, so-called application partners were also involved in the project who were willing to use and actually test the first virtual initial settings. These application partners were: POST CH AG (transport and logistics), Trivadis AG (informatics) and SKAN AG (isolation and clean room technologies). Vitra AG and Cisco System (Switzerland) were also application partners.

In summary, it can be said that the project plan OviK seamlessly connected the furnishings with the video technological components, something which was new and innovative. The permanent audio-visual connection was the key medium linking the rooms. This connection could be used at any time by anyone without any further active interaction with the video technological components to get in touch with people in the other place. Another prerequisite was the integration of furniture appropriate for an OviK.

The development of such interconnected components during the project was made possible thanks to the close cooperation of the two project partners, Vitra AG and Cisco System (Switzerland) GmbH.

Further information about the OviK project can be found on the following website: http://www.fhnw.ch/aps/ifk/projekte

3 Theoretical and Empirical Foundation

The following section provides the theoretical and empirical foundation to understand what is meant by informal- and by computer-mediated informal communication. In addition, a brief overview of other, studies related to virtual cafés will be given. Moreover, key success factors are presented which promote (computer-mediated) informal communication. The *situation awareness* model is also introduced to embed the analyzed subject in the literature.

3.1 Informal Communication

Kraut et al. (1990) describe informal communication as something that happens spontaneously. It is interactive and has many subjects ranging from work related to more private communications. They also worked out dimensions to differentiate informal from formal communication. Hrastinski (2010) complemented these dimensions, but focused more on computer-mediated informal communication. According to these dimensions, as seen in Fig. 4, computer-mediated informal communication is *unscheduled, interactive, spontaneous, optional, participant organized* and *experience-focused.* Further, it is characterized by *informal language* and generates *few costs* (Hrastinski 2010).

communication:	formal	vs.	informal
dimension:	scheduled	vs.	unscheduled
	one-way	vs.	interactive
	present agenda	vs.	emergent agenda
	mandatory	vs.	optional
	authority-organised	vs.	participant-organised
	content focus	vs.	experience focus
	formal langage	vs.	informal language
	high cost	vs.	low cost

Fig. 4 The formal and informal dimensions of computer-mediated communication (adapted from Hrastinski (2010), p. 26)

Now that computer-mediated informal communication has been explained, the virtual café and related literature will be presented.

3.2 Pilot Scenario "OviK-Virtual Café"

As stated before, a virtual café is a semi-public place that enhances informal cross-company encounters and can be differentiated from formal video conferences (see Sect. 2.1.3). Two cafés are connected virtually by means of a video broadcasting system (see Fig. 5) so that both cafés are linked together constantly with sounds and images (Tollmar et al. 1999).

Fig. 5 Virtual Café.

Explanation:

Left-hand side: Illustration of a Virtual Café, © CCTP Competence Centre for Typology and Planning in Architecture, 2015.

Right-hand side: Example of a Virtual Café in the Usability Lab of the School of Applied Psychology in Often, Switzerland, 2015.

Since the 1990s occasionally studies have been carried out that have dealt with virtual cafés (e.g. Kraut et al. 1990; Tollmar et al. 1999). However, due to the technological shortcomings, the idea could not be then implemented (Schulze et al. 2014).

In addition to the knowledge what a computer-mediated communication and a virtual café is, research has shown that there are six success factors which promote computer-mediated informal communication. They will now be explained in the following section.

3.3 Success Factors for Computer-Mediated Informal Communication

Kraut et al. (1990) defined five prerequisites, respectively, success factors that promote computer-mediated informal communication. Schulze et al. (2014) later added a sixth factor, confidentiality regulation.

1. *Low personal cost:*
   The first of the six factor is *low personal cost* (cf. Kraut et al. 1990) which means that certain conditions have to be fulfilled which ease informal communication. Therefore, according to Kraut et al. (1990), as little effort as possible should be required to establish communication.

2. *Social Presence:*
   Social presence is the second factor (cf. Schulze et al. 2014). Informal communication is based on the certainty that someone is there. However, there is a difference between knowing about the others activities and the perception of the others in the same room (co-presence/telepresence) (cf. Kraut et al. 1990, quoted from Schulze et al. 2014). With computer-mediated informal communication, it is important to be able to judge whether potential communication partners are inside the other room and whether or not they want to communicate (cf. Kraut et al. 1990, quoted from Schulze et al. 2014).

3. *Abundance of the transferred Information:*
   The third factor is called the *abundance of the transferred information* (cf. Schulze et al. 2014). Kraut et al. (1990) concluded that in informal communication various senses should be involved and that the visual channel plays an important role when a conversation starts. In addition, the combination of a visual- with an auditory channel then ensures that communication can be conducted (cf. Kraut et al. 1990).

4. *Common working environment:*
   The *common working environment* and shared objects is the fourth factor (cf. Schulze et al. 2014) both of these elements are very important for information communication according to Kraut et al. (1990). Informal communication needs a common theme (cf. Al-Zubaidi and Stevens 2004).

5. *A concentration of suitable partners:*
   The next factor, the fifth, is *concentration of suitable partners* (cf. Kraut et al. 1990). A certain spatial proximity is necessary as well as a concentration of potential communication partners so that meeting someone spontaneously becomes possible (cf. Schulze et al. 2014). Computer-mediated informal communication could be supported by a system, which would find *appropriate communication partners* or initiate contact with other people (cf. Kraut et al. 1990, quoted from Schulze et al. 2014).

6. *Confidentiality Regulation:*
   The sixth and last factor is *confidentiality regulation* (cf. Schulze et al. 2014). Users of communication systems should have the possibility to regulate the level of confidentiality. This could be achieved by having a spatial separation: one zone to make contact and another one into which people could withdraw and have a private talk (cf. Schulze et al. 2014).

Having explained the six success factors, respectively, prerequisites for computer-mediated communication, the *situation awareness* model and its elements (e.g. *activity*) will now be presented. In this study, computer-mediated informal communication can be seen as an *activity*.

3.4 Theoretical Framework Model: Situation Awareness

Endsley's (1995) framework model of *situation awareness* (SA) is looked upon as a theoretical background and as an application-oriented concept within the context of complex working worlds (Schaub 2012). According to Schaub (2012), this model chiefly includes aspects of attention and consciousness. It must be added though, that in the SA model, the interaction between person and environment takes centre stage (cf. Endsley 1995). According to Schaub (2012), the model integrates different perspectives from "action theory" (cf. Hacker 1986), "natural decision making" (cf. Klein 1997; Orasanu and Salas 1993) and "complex problem solving" (cf. Dörner 1989; Funke 2003; Schaub 2009). For Endsley (1995), SA is to be understood as a level of knowledge which determines how much a person knows about a current situation. This knowledge level is composed of *perception*, *comprehension* and *projection* (see Fig. 6).

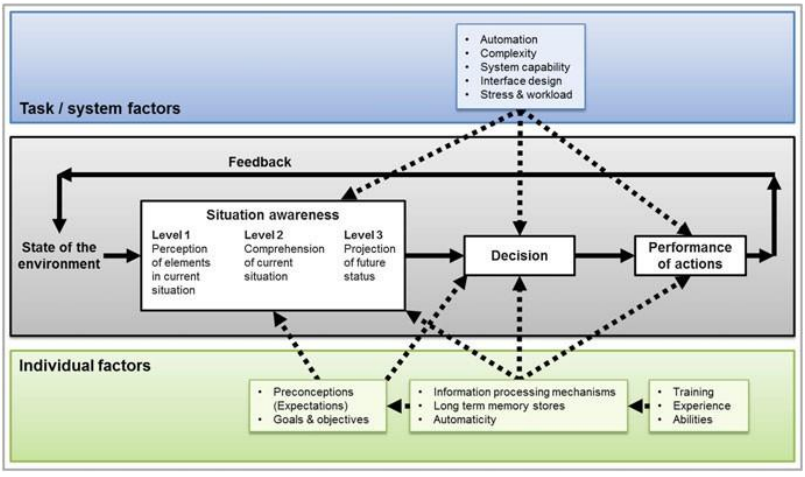

Fig. 6 Framework of situation awareness (adapted from Endsley (1995), p. 35)

SA's three levels (*perception*, *comprehension* and *projection*) (see Fig. 6) can also be understood as higher cognitive[3] functions respectively processes, which, occur before a *decision* and can ultimately turn into concrete actions (Schaub 2012). According to Schaub (2012), the three levels can be described as follows (cf. Fig. 6):

[3]Cognition can be understood as a general term that involves conscious and unconscious mental processes (e.g. perception or thinking) (Wirtz 2013).

1. The objects in the environment must first be *perceived* by the particular person. This level thus includes the *perception* of the condition, the characteristics and the dynamics of the relevant situational elements.

2. In a further step, the meaning of the situational elements must be understood by the particular person. This level describes the integration of the situational elements into a whole picture, which allows the person to *comprehend* the actual situation. Therefore, this integration causes the *comprehension* of the meaning of the individual situational elements.

3. In the third step, changes in the environment or in a future condition of the object can be *predicted*, respectively, *projected* by a person for a certain period of time. Expectations about the future behavior of the situational elements can be generated that are based on the achieved *comprehension* of the situation in the second level.

However, these three levels or rather, these higher cognitive functions can be influenced from two directions (see Fig. 6): from the particular person (individual factors) and from environmental factors (task and system factors). Additionally, fundamental cognitive resources, for example, *information processing mechanisms* as well as *long term memory stores* and *automaticity*, further influence more complex subprocesses such as an individual's *goals*, *expectations*, and *hypotheses* (Schaub 2012).

In summary, in order to informally communicate the making of a *decision*, respectively, *the performing of an action*, the *perception* of the situational elements is key. Due to the *perception* of the situational elements, their meaning can be understood. This is important because the particular person can then predict, respectively, *project* the development of the situation and the future condition of the actual surroundings elements, which in turn is key for *decision* making and taking *action* to accomplish *goals* (Schaub 2012).

4 Relevance and Question

Based on research (cf. Schulze et al. 2014), it is assumed that the technical infrastructure, such as monitor resolution or audio quality, and spatial aspects, such as room partitioning, influence the experience and the users' communication behavior in a virtual café.

With the current level of knowledge, it is not known yet which conditions are responsible for the initiation of informal communication in a virtual café. This points to a research gap, which should be addressed within this study.

Therefore, the following research question has been formulated:

Question: Which conditions promote and/or hinder informal communication in a virtual café?

Investigating this question should bring new scientific knowledge and also be of practical use. As mentioned before (see Sect. 1), there is a trend today towards a cross-company collaboration, whereby this geographic separation of the employees endangers informal communication (cf. Schulze et al. 2014). This study should provide practical indications for the design and introduction of virtual cafés to reinforce the use computer-mediated communication.

In the following section, the study's methodology is explained.

5 Methodology

In spite of all efforts to the contrary, the study of informal communication in a virtual café can be considered to be unchartered territory. Therefore, a qualitative procedure was chosen (cf. Lamnek 2010). The reason for this decision was the following:

> The virtual café as a research object had to be first constructed by the users as there was no comprehension about it. Therefore, the users had to first experience a virtual café themselves and then try it out to become experts in regard to the subject.

Based on this reason or rather, this presupposition, a specifically modified iterative and qualitative procedure was developed: The approach of Kleining's (1986) *qualitative experiment* and the three steps of Spinuzzi's (2005) *participatory design*, *1. initial exploration of work*, *2. discovery process*, and *3. prototyping*, were adapted and combined. An overview of developed process will now be described (adapted from Spinuzzi 2005):

1. *Initial exploration of work:*
   The purpose of the first step was to let the authors of this study become comfortable with the way users collaborate, which included researching (literature research, field observations and expert interviews), analysis of the used technologies (e.g. various audio-visual conferencing systems) and the process of designing, introducing and using OviKs (e.g. behavioural routines: initiation of informal communication).

2. *Discovery process:*
   In the next step, the goals and the desired results of the users were clarified (e.g. through literature research, field observations and expert interviews). This was done based on the technical possibilities and on the interests and

experiences of the partners who were involved in the research project. With this gained knowledge, a list with key dimensions was deduced. Based on the list different initial settings of virtual cafés were conceptualised. In the *qualitative experiment*, the dimension list together with the initial settings built the foundation for the systematic variation of the different aspects (e.g. put the coffee machine either inside or outside of the camera area, etc. see Fig. 7).

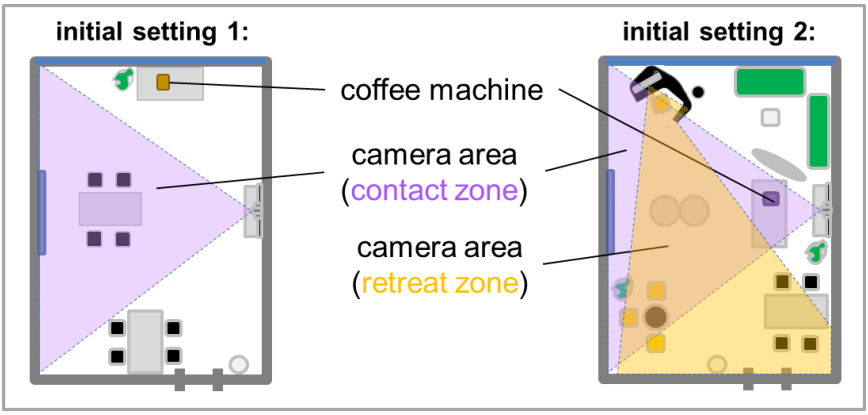

Fig. 7 Variations of initial settings, Usability Lab of the School of Applied Psychology in Olten, Switzerland, 2015.

Explanation:
Initial setting 1 shows a possible variation of a virtual café. This setting has only a contact zone. In comparison, the more complex initial setting 2 has a retreat zone in addition to a contact zone for its users.

3. *Prototyping:*

In this last step, the developed initial settings of a virtual café were implemented in the Usability Lab of the School of Applied Psychology in Olten. As defined by the *qualitative experiment* (cf. Kleining 1986), the object of research was observed from different perspectives and as a result, new psychological phenomena could be discovered. This was possible due to the characteristic variations of the various dimensions.

The implementation of the *prototyping* took place within the framework of three 1-day workshops. 19 employees (users) of the research-, application- and implementation partners tested different complex virtual café settings (see Fig. 7). In a participatory way, the users could also revise the café setting requirements, modify them in order to try them out again. Each setting had a contact- and/or a retreat zone (see Fig. 7). At the same time, 20 group interviews were conducted. Furthermore, the strategy of maximum variation was used for the sampling of participants (cf. Flick 2010). During the selection process, attention was paid to gender, sample size, hierarchical levels, relationships between the participants, organizational background and also experience with virtual cafés in order to have as many different perspectives as possible. The participants worked in the field IT, Sales, or Product Management, for example.

The results were analysed with the heuristic and detecting principles of Hagemann (2003). All coded statements were checked for double coding (those statements which could be assigned to several categories). Furthermore, the connection, respectively, the relationship between the identified categories was defined (cf. Hagemann 2003) (see Fig. 8).

6 Results

A psychological phenomenon (overarching construct, respectively, supercategory) showed itself to be the most relevant result for the virtual café. In this study, it is called *situational sense* (see Fig. 8) and consists of three subcategories:

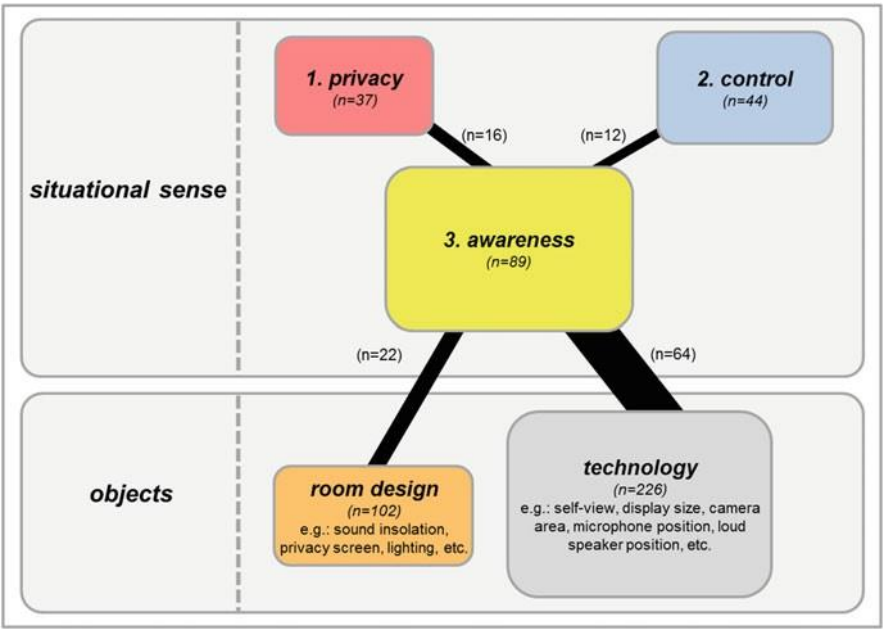

Fig. 8 Illustration of results. Frequency of connections (double coding) between the category awareness and the other categories as well as all mentions of the categories itself

1. *Privacy (37 mentions):*
   The feeling of being protected, of not being observed or monitored.

2. *Control (44 mentions):*
   The feeling of being able to control the activities in a room and to use the technology and the room according to one's individual needs (e.g. being able to have a coffee, while not having to participate in the virtual café).

1. *Awareness (89 mentions):*
   Consciousness (also understood as a level of knowledge) of the own and the other room, containing the present people and the available objects. Moreover, it contains the consciousness of the visual and auditory area of present people as well as of the video transmission system.

Awareness develops because the users constantly revise their knowledge which includes these three different levels of knowledge:

a. *Knowledge of the other person (presence, identity, message conveyance) in one's own room and in the other one:*
   With this knowledge it becomes apparent who (identity) is in one's own room and who is in the other one and to what degree the conveyed message in the communication (i.e. intention, interest, and attention) can be understood as such by both parties.

b. *Knowledge of the object (attendance and use) in one's own room and in the other one:*
   The user knows which objects are in one's own room and in the other one and how to use them.

c. *Knowledge of the visual and auditory areas of one's own room and of the other room (present people and video transmission system):*
   The user knows how far the visual and the auditory area of present people and of the video transmission system extend in one's own room and in the other room (room height, width and depth). This includes the knowledge of the limits of the visual and the auditory area.

In addition, it is clear from the results that the supercategory (see Fig. 8) *situational sense* and the supercategory *objects* as well as its subcategories are frequently connected (double coding).

7 Discussion and Design Recommendations

Concerning the subcategories *privacy*, the use of the virtual café is being hindered if the users cannot do what they want (activities) without being observed (e.g. making or drinking a coffee). On the other hand, it is an advantage when the users feel they are unobserved and unheard. As for the subcategories *control*, things which could enhance computer-mediated informal communication are beneficial, especially when, for example, the volume of a loud speaker can be regulated in order to better hear the users in the other room. However, it can be a disadvantage if, the technical infrastructure in the other room can be changed.

For example, if someone remotely changes the camera angle in the other room, then the people in that room could feel that their *privacy* has been invaded. Regarding the subcategories *awareness*, it is a disadvantage for the computer-mediated communication if the users do not have the possibility to find out who is in their room and who is in the other room and if people outside the visual area can still follow the conversation. In contrast, the knowledge of how far the visual and/or the auditory area stretches into one's own room and into the other room is helpful. Knowing how people perceive each other in their own room and in the other room also enables informal communication.

According to Hrastinski (2010) (see Sect. 3.1) computer-mediated communication differentiates itself from formal communication by the *lower costs*. This is also a success factor (Kraut et al. 1990). Based on the results (cf. Sect. 6), it can also be assumed that *low costs* are not possible if the users of both cafés do not develop *awareness*. This is because establishing a conversation is related with more effort (e.g. calling the attention of users of the other room). In reverse, an existing *awareness* of the users (v.i.z. users of both cafés develop *awareness*, thus it is *reciprocal*), more likely result in *lower costs* and in an informal communication.

Referring to Endsley's (1995) framework model of *situation awareness* (see Sect. 3.4), the authors suppose there is a large similarity to the phenomena *awareness* (see Sect. 6) since both represent a level of knowledge. The key difference between the two phenomena lies in the fact that *awareness* represents a specific level of knowledge in the context of virtual cafés, respectively, computer-mediated informal communication. Further, *reciprocal awareness* does not concern itself with the knowledge level of a single person, but with that of several people and their connected reciprocal interactions. For example, there would be no contact between people who do not know each other.

Furthermore, when the success factors are considered, some overlapping of computer-mediated communication (cf. Kraut et al. 1990; Schulze et al. 2014; see Sect. 3.3) and *awareness* can then be detected. For example, both *social presence* and subcategory a. of *awareness* (knowledge of the other person) (see Sect. 6) mention knowledge of other people's presence. The latter one differentiates itself from *social presence* in such a way that not only the presence, but also the identity and the message of the other person must be considered.

Awareness is the most important category of this study. When it was compared to other psychological phenomena, respectively, subcategories, *awareness* had the most connections (double codings, see Fig. 8) of all categories. Furthermore, *reciprocal awareness* facilitates computer-mediated informal communication. Therefore, we suggest adding a seventh factor, *reciprocal awareness*, to the existing prerequisites, respectively, success factors of computer-mediated informal communication (Kraut et al. 1990; Schulze et al. 2014; see Sect. 3.3). Based on the discovered connections (double codings), it can be concluded that the three

subcategories (of the category *situational sense*) reciprocally influence each other and can indirectly promote or hinder computer-mediated informal communication. It was also shown that users would like a good deal of *control* over the knowledge and the presence of people in the other room (thus subcategory a. of *awareness*; see Sect. 6), which, on the other hand, limits the perceived *privacy* of the people in that room.

Therefore, when a virtual café is designed, the subcategories *awareness*, *privacy* and *control* should to be balanced by the spatial and technological aspects of a virtual café. For example: "You can see or hear me in the other room only when I can see or hear you". If the balancing is successful, an adequate perception of *privacy* and *control* can be achieved.

Furthermore, spatial and technical aspects should be adequately designed in order to support *reciprocal awareness* (knowledge categories a., b., c., see Sect. 6).

Despite the knowledge gained by this study more research is needed to better understand conditions which promote or hinder informal communication in distributed settings (e.g. virtual cafés). Interesting avenues for research could be the generalisation of the findings in regard to *reciprocal awareness* to other crosscompany computermediated communication setting. Further research might examine the optimal level of *awareness*, *privacy* and *control* to promote computermediated informal communication.

References

[1] Al-Zubaidi, K. & Stevens, G. (2004). CSCP at Work. In R. Keil-Slawik, H. Selke & G. Szwillus (Eds.), *Mensch & Computer 2004: Allgegenwärtige Interaktion* (S. 137–146). Munich: Oldenbourg.

[2] Bismarck, W.-B. von, Held, M. & Maslo, J. (1999). Anforderungen an ein System zur Unterstützung der informellen Kommunikation. *Zeitschrift für Arbeitswissenschaft, 1,* 10–17.

[3] Bismarck, W.-B. von, Held, M., Schütze, H.-J. & Alex, A. (1999). Die Verbreitung, Nutzung und Wahrnehmung von Medien in Organisationen. *Mannheimer Beiträge zur Wirtschafts- und Organisationspsychologie, 1,* 68–89.

[4] Brändle, N., Etzensperger, C., Künzi, D. & Vautier, C. (2010). *Swiss Issues Branchen. Die Struktur der Schweizer Wirtschaft 1998 - 2020. Credit Suisse Zürich*. Retrieved July 23, 2016, from http://www.ub.unibas.ch/digi/a125/sachdok/2010/BAU_1_5312089.pdf.

[5] Coradi, A. & Boutellier, R. (2013). Treffpunkt Kaffeemaschine: Begegnungsräume fördern kreative Interaktionen. *Zeitschrift für Führung und Organisation zfo, 82*, 322–328.

[6] Dörner, D. (1989). *Die Logik des Misslingens.* Reinbek: Rowohlt.

[7] Endsley, M. R. (1995). Toward a theory of situation awareness in dynamic systems. *Human Factors, 37,* 32–64.

[8] Fish, R. S., Kraut, R. E., Root, R. W. & Rice, R. E. (1993). Video as a technology for informal communication. *Communications of the ACM, 36,* 48–61. Retrieved July 23, 2016, from http://www.comm.ucsb.edu/faculty/rrice/A42FishKrautRootRice1993.pdf.

[9] Flick, U. (2010). *Qualitative Sozialforschung*: Eine Einführung (3rd ed.). Reinbek: Rowohlt Taschenbuch Verlag.

[10] Funke, J. (2003). *Problemlösendes Denken*. Stuttgart: Kohlhammer.

[11] Hacker, W. (1986). *Arbeitspsychologie*. Berlin: VEB Deutscher Verlag der Wissenschaften.

[12] Hagemann, O. (2003). Qualitativ-heuristische Methodologie im Lehr-Dialog. In O. Hagemann & F. Krotz (Eds.), Suchen und Entdecken: Beiträge zu Ehren von Gerhard Kleining. Berlin: Rhombos-Verlag.

[13] Hrastinski, S. (2010). The informal and formal dimensions of computer-mediated communication: a model. *International Journal of Networking and Virtual Organisations, 7*, 23–38.

[14] Klein, G. (1997). The current status of the naturalistic decision making framework. In R. Flin, E. Salas, M. Strub & L. Martin (Eds.), *Decision making under stress: Emerging themes and applications* (pp. 11–28). Aldershot: Ashgate.

[15] Kleining, G. (1986). Das qualitative Experiment. *Kölner Zeitschrift für Soziologie und Sozialpsychologie*, *38*, 724–749.

[16] Kraut, R. E., Fish, R. S., Root, R. W. & Chalfonte, B. L. (1990). Informal communication in organizations: Form, function, and technology. In S. Oskamp & S. Spacapan (Eds.), *Human Reactions to Technology: The Claremont Symposium on Applied Social Psychology* (S. 145–199). Beverly Hills: Sage Publications.

[17] Lamnek, S. (2010). *Qualitative Sozialforschung* (5th ed.). Weinheim: Beltz Psychologie Verlags Union.

[18] Orasanu, J. & Salas, E. (1993). Team decision making in complex environments. In G. Klein, J. Orasanu, R. Calder- wood & C. E. Zsambok (Eds.), *Decision making in action: Models and methods* (pp. 327–346). Norwood, New York: Ablex.

[19] Pentland, A. (2012). The new science of building great teams. *Harvard Business Review, 90*(4), 60–70.

[20] Rack, O., Konradt, U. & Clases, C. (2011). Virtuelle und globale Kooperation. Editorial zum Themenheft. *Wirtschaftspsychologie*, *13*(3), 41–51.

[21] Schaub, H. (2009). *Der Soldat als Human Factor - Störfaktor moderner Rüstungsprojekte?* (Gneisenau Blätter: „Soldat und digitales Schlachtfeld", Vol. 8). o. O.: Gneisenau-Gesellschaft der OSLw e.V..

[22] Schaub, H. (2012). Wahrnehmung, Aufmerksamkeit und „Situation Awareness" (SA). In P. Badke-Schaub, G. Hofinger & K. Lauche (Eds.), *Human Factors: Psychologie sicheren Handelns in Risikobranchen* (S. 64–81). Berlin Heidelberg: Springer.

[23] Schulze, H., Burkhard, R., Knöpfli, D., Mateescu, M. & Ryser, T. (2014). Das virtuelle Café. Ein Ansatz zur Förderung computer-vermittelter informeller Kommunikation. In T. Skerlak, H. Kaufmann & G. Bachmann (Eds.), *Lernumgebung an der Hochschule. Auf dem Weg zum Campus von morgen* (Medien in der Wissenschaft, Vol. 66, S. 237-260). Münster, New York: Waxmann.

[24] Spinuzzi, C. (2005). The Methodology of Participatory Design. *Technical Communication, 52*, 163–174.

[25] Tollmar, K., Chincholle, D., Klasson, B. & Stephanson, T. (1999). VideoCafé–virtual Espresso-Cafés and semi-located communities. *Technical report, TRITA-NA-D9905, CID Report CID-47*. Stockholm: KTH.

[26] Wirtz, M. A. (Eds.). (2013). *Dorsch - Lexikon der Psychologie* (16th ed.). Bern: Hans Huber Verlag.