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Presence, Privacy, and PRIMIFaces: Towards Selective Information Disclosure in Instant Messaging

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Abstract. Efficient distant cooperation often requires spontaneous ad-hoc social interaction, which is only possible with adequate information on the prospective communication partner. This often requires disclosing and sharing personal information via tools such as instant messaging systems and can conflict with the users' wishes for privacy. In this paper we present an initial study investigating this trade-off and discuss implications for the design of instant messaging systems. We present the functionality and design of the PRIMIFaces instant messaging prototype supporting flexible identity management and selective information disclosure.

Author Keywords. Computer-Supported Cooperative Work, Computer-Mediated Communication, Instant Messaging, Awareness, Information Sharing, Privacy, Reciprocity.

ACM Classification Keywords. H.5.2 [Information Interfaces and Presentation]: User Interfaces—Graphical User Interfaces, User-Centered Design; H.5.3 [Information Interfaces and Presentation]: Group and Organization Interfaces—Computer-Supported Cooperative Work.

1 Introduction

Efficient distant cooperation often requires spontaneous ad-hoc social interaction, which is only possible with adequate information on the prospective communication partner. This requires disclosing and sharing personal information on presence and how to be reached and so forth (supported in tools such as instant messaging (IM) systems) and can conflict with the users' wishes for privacy. In CHI and CSCW considerable research has focused on disclosing and sharing information in the form of group awareness in general [Dourish & Bellotti 1992], on IM [Herbsleb *et al.* 2002], and on the privacy trade-off [Hudson & Smith 1996].

In the literature often reciprocity is suggested as a solution to this trade-off. Generally, reciprocity describes a vital social norm, which denotes that if somebody gives something

to another or helps in any way, then the other is obliged to return the favor [Goulder 1960]. More precisely, reciprocity can be implemented as a policy that ‘would allow user 1 to access information concerning user 2 only if user 1 allows user 2 to access the same data about user 1 [Godefroid *et al.* 2000].

In the remainder of this paper we present an initial study investigating this trade-off and challenging reciprocity as the silver bullet for all systems; and we discuss the study’s implications for the design of IM systems. We present the functionality and design of the PRIMIFaces prototype supporting IM based on flexible identity management and selective information disclosure.

2 Study on Presence and Privacy

We did an initial study, which aimed at finding out the users’ preferences with respect to information disclosure and reciprocity as well as informing the design of our prototype. The study was conducted in 2005 at the Cooperative Media Lab Open House at a midsized university in Germany. 17 participants were chosen among event visitors (mainly students, their parents, officials, and staff members). 64% of them were female, 36% male. Participants had an average age of 27 years and nearly 11 years of computer experience.

The survey consisted of a five-part questionnaire asking people about their information sharing preferences in particular situations: The *first* part evaluated the participants’ trust towards specific groups of people (e.g., family members, work colleagues). The *second* part evaluated factors influencing the participants’ information disclosure behavior. The *third* part was the largest section: Here, participants were asked to provide three information entities of different sensitivity (i.e., their current presence and reachability, current activity, and their name), and to indicate their preferred precision for sharing (i.e., true, vague, none, or free-form) for each of them as a response to varying information disclosure of their counterparts (i.e., true and detailed information; and vague and partial information with vague information about their presence and where they can be reached, no information about their activity, and true information concerning their name). The results were mapped to three different situations (i.e., private, leisure, work) and in general. Part *four* asked them to rate the sensitivity of named information entities. The *fifth* and final part was used to gather standard socio-demographic data.

It took 30 to 40 minutes to complete the questionnaire, especially the third part required participants to fill out at least 120 precision fields. Yet, besides the high effort and the fact that the participants did not get any compensation only a few people did not complete the questionnaire. This might be due to the fact that the participants’ interest was raised by our system demos and their own exploration of our systems and prototypes during the Open House.

2.1 Results

In this section we report on some of the major findings especially concerning reciprocity. On a whole the role of reciprocity—here understood as a situation, in which participants and counterparts disclose information of the same kind and precision—turned out to be different than anticipated. We initially expected people to generally follow the norm of reciprocity and that they would consequently adjust their information sharing settings

broadly to the settings of the respective incoming information bundle. Yet, in most cases studied people did not simply follow the ‘what you do to me I do to you’ pattern. We will explain details below.

2.1.1 Participants Often Disregarded Reciprocity

Due to the study’s design it was up to the participants to establish reciprocity as reaction to what was offered in setting T (true and detailed information) and V (vague and partial information with vague information about their presence and where they can be reached, no information about their activity, and true information concerning their name). However, in most cases they did not. Only 21% of all cases were reciprocal (i.e., all three information chunks were provided at the same precision by the two parties). The data show that an average of 36% regarded reciprocity in setting T where counterparts provide all information in a true manner. However, this value dropped down to an average of 7% for setting V where only partial information is provided. Table 1 denotes the shares of reciprocity for each of the above-mentioned situations of setting T and V.

Setting	Private	Leisure	Work	General
T	10%	38%	38%	46%
V	4%	14%	6%	4%

Table 1. Probabilities of reciprocity.

The strong decrease is mainly due to the study’s choice of settings illustrating two effects: in setting T participants were only able to provide equally or less precise information as their counterpart (we call this ceiling-effect) while in setting V they could additionally provide more or partially more/less information (later referred to as mixed).

2.1.2 Participants Considered Trust

The previous suggests great differences between settings T and V. However, within these settings the differences between different types of recipients turned out to be even more significant. More specifically, we identified four groups of individuals treated differently by participants. Their kind of trust relationship proved to be a strong influencing factor for this categorization (for a more detailed analysis of people in information sharing settings see [Olson *et al.* 2005]). We found that there are people of general high trust (GHT), people with specific high trust (SHT) only in certain situations, general medium trust (GMT), and finally general low trust (GLT) individuals. Table 2 denotes characteristics and examples of these individuals.

Name	Characteristics	E.g.
General high trust	General high trust values in all of the tested situations (leading to a high trust average)	Family members, friends
Specific high trust	High trust values in specific situations tested and low trust values in the remainder (leading to a medium trust average)	Colleagues
General medium trust	General medium trust values in all tested situations (leading to a medium trust average)	Acquaintances
General low trust	General low trust values in all tested situations (leading to a low trust average)	Strangers

Table 2. Four trust groups.

Additionally, some study participants made very valuable comments such as the following: “I don’t trust all family members the same way, I distinguish them on a trust group basis”. Therefore, we do not consider family as a whole as GHT trust group but only selected family members. Table 3 shows the probability of reciprocity per trust group.

Setting	GHT	SHT	GMT	GLT
T	75%	15%	13%	0%
V	7%	10%	10%	3%

Table 3. Probabilities of reciprocity and trust.

High shares of reciprocity with GHT trust group (75%) in setting T can be explained by the ceiling-effect while setting V denotes a value of 7%. However, there is hardly any reciprocity with GLT trust groups in either setting (T: 0%, V: 3%). We expect this to change in a prospective setting where the counterparts provide no information at all: due to the general behavior towards GLT these cases become reciprocal (i.e., no information offered and no information received). This illustrates that high shares of reciprocity do not correlated with high trust values. GMT and SHT appear to have a stable share within 10 to 15 % of the cases.

2.2 Discussion

The study suggests that participants distinguish recipients and situations. As Lederer et al. [2003] we also found that the recipient is a stronger determinant than the situation. However, participants did not adhere to reciprocity to the extent expected. People mostly disregarding reciprocity. Trust determined participants’ behavior but trust values and reciprocity do not correlate.

3 PRIMIFaces

The concept of the PRIMIFaces IM prototype departs from the finding of this study that systems should provide flexible mechanisms for selective information disclosure by allowing users to easily specify and adapt their sharing of personal information, rather than enforcing mandatory reciprocity. Consequently, PRIMIFaces is based on two principles: *faces* of Goffman [1967]; and *feedback and control* of Bellotti and Sellen [1993].

The work of Goffman on *faces* gives valuable insight into the social behavior of humans in groups. Although Goffman studied face-to-face situations in which two or more individuals are physically present for each other [Lemert & Branaman 1997], his work on identity management is highly relevant and stimulating for the design of systems supporting social interaction and sharing of personal information over distance. Goffman saw interaction among humans as performance in which all persons involved try to create impressions on the audience [Goffman 1959; Goffman 1967; Lemert & Branaman 1997]. The face is a central part; it is the image that the performer presents combined with the expectations and interpretations of the audience. Goffman writes that ‘face may be defined as the positive social value a person effectively claims for himself by the line others assume he has taken during a particular contact’ [Goffman 1967, p. 5].

The framework on privacy developed by Bellotti and Sellen [1993] introduces the principle of *feedback and control*. The authors looked at specific challenges for computer-mediated awareness and communication. One central aspect in remote interaction is the disembodiment of the persons involved and the resulting reduced feedback on the information and accessibility that is shared and broadcasted to others as well as reduced ability to control the information and accessibility. Bellotti and Sellen [1993, p. 80] introduced feedback as ‘informing people when and what information about them is being captured and to whom the information is being made available’ and control as ‘empowering people to stipulate what information they project and who can get hold of it’.

3.1 Novel Concepts for Faces, Sources, Contacts

The PRIMIFaces prototype provides standard IM functionality that is needed in most IM systems, and several novel concepts.

PRIMIFaces provides the following standard functionality for IM: users can log in and log out, set their online status, see the online status of other online users, and have spontaneous text chats with other online users.

Beyond that, PRIMIFaces supports selective information disclosure based on *faces* and provides feedback and control via *contacts* and *sources*:

- *Faces*. Every user has a default or public face besides an arbitrary number of custom faces (e.g., work, projects, friends). They serve as containers for sources and contacts; and they are mutable—that is, muting a face can stop a face’s information exchange.
- *Contacts*. Users may assign other users to particular faces as contacts who receive the face’s information. In turn the contacts can provide their information on their own face basis.

- *Sources.* For each face users can assign specific information sources—information they choose to reveal via that particular face. Sources can be sensors that we attached to the IM system and the respective data they capture (e.g., running applications, keyboard and mouse activities, CPU usage), free-form static information explicitly provided by the users (e.g., the phone number or email address), or arbitrary dynamically created information. Like faces, sources can be muted—that is, they can be stopped from emitting their contents on a single source basis.

The assignment of users' faces and respective contacts and sources can be symmetrical or asymmetrical. For instance, user A can share more information sources with user B than user B offers in turn. Figure 1 shows a screenshot of PRIMIFaces (where user mario has 5 faces represented as the pieces of the cake; the face on the left contains the contacts tobias and stefanie and various sources such as CPU usage, location of the user, mouse movement, running applications, and the users contact information; the face on the top contains contact tim as well as various sources; the other faces are yet empty).

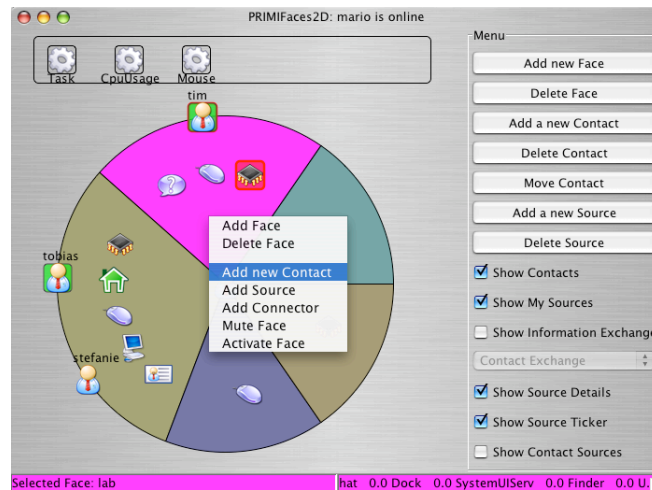


Figure 1. PRIMIFaces screenshot.

PRIMIFaces can visualize the reciprocity ratio of incoming and outgoing information as a means of feedback for analyzing faces and reacting eventually. The users choose from three types of exchange ratios: per face, per contact, or total. Depending on the type specific areas in the visualization are colorized: green color represents incoming information, and red color represents outgoing information. A ticker provides additional information on contact sources in the respective face.

Figure 2 shows a screenshot of PRIMIFaces (with a different configuration, where user stefanie has 3 faces represented as the pieces of the cake; for each face she has one contact respectively: tim, tobias, and mario, and various sources; the ratio of the diameter of the inner (red) circle and the outer (green) circle tells that overall stefanie is sharing roughly the same amount of data as she receives).

3.2 Implementation

PRIMIFaces builds on the PRIMIBase 3.0 and SensBase 1.6 infrastructures implemented with the Cooperative Media Lab platforms PRIMI [Gross & Oemig 2005] and Sens-ation

[Gross *et al.* 2006]. The PRIMIFaces prototype was developed in Java (version 1.4.2) with Eclipse (version 3.1M2) on Mac OS X (version 10.4).



Figure 2. PRIMIFaces screenshot with ratio.

4 Conclusions

In this paper we have addressed the trade-off between on the one hand providing personal information for increased availability and easier spontaneous contacts and on the other hand privacy protection. We have presented a preliminary study that showed that participants did not insist on reciprocity, but rather wanted flexible and easy means for controlling their information sharing. We have introduced the PRIMIFaces prototype based on the notion of faces and feedback and control.

An informal study of the PRIMIFaces prototype showed that users easily understood the notion of faces and quickly learned how to handle them and assign contacts and sources. The users also appreciated the muting function and used it for short periods in which they wanted to avoid disruption. However, the meaning of the different feedback visualizations was less clear; they should be improved in the future.

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