

‘I Know That You Know’ - Ascertaining Mutual Awareness of Recipient’s Availability Status in Instant Messaging Applications

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Abstract. This study investigated ways to attain mutual, reciprocal awareness of recipient’s availability status in Instant Messaging (IM) applications. For that purpose we designed, implemented and tested a prototype of an IM system named Do^{NT}Bother. The analysis of the quantitative and qualitative results showed that displaying status indication in the chat box encouraged participants to show more respect towards the communicative state of their colleagues comparing to situations, in which the status indication was presented only in the ‘buddy list’ view. These findings empirically confirm the importance of reciprocal awareness as defined by Erickson and Kellogg [12] who argued that, to stimulate social behaviours, systems need to maintain the mutual knowledge of who knows what of the information that is shared among users. The study also showed that mutual awareness needs to be maintained not only during communication initiation but also throughout the entire communication duration. To achieve that Instant Messaging systems need to: (i) support indicating the time frame for answering messages in situations when the recipient is not instantaneously able to engage in a conversation, (ii) support specifying the urgency of a message and also (iii) support indicating communication breakdowns especially if they are caused by a reason occurring outside the application domain.

Keywords: Instant Messaging systems, availability, mutual awareness

1 Introduction

As there is no measurement regarding which behaviours are considered as socially acceptable people tend to develop their own conventions that define the best practices for different situations and different communities [5, 17, 9, 8, 16, 21, 23]. Current Instant Messaging (IM) systems are largely unaware of such social conventions and, therefore, do not account for the impact their functionality has on how people interact with each other [13]. Erickson and Kellogg [12] argued that, to stimulate social behaviours, systems supporting mediated communication need to maintain mutual

knowledge of who knows what of the information that is shared among communicators. By providing such cues people could be given the opportunity to attune to the communicative needs of others and act in ways that are both coherent and graceful.

The goal of this study was to investigate what is a successful way to ascertain mutual awareness about the recipient's availability status in IM applications. To reach this goal we implemented a prototype named Do^{NT}Bother, which was then evaluated in a web design company for a period of three weeks. The contributions of this research include the quantitative and qualitative measurements assessing the proposed solutions and a set of implications that promise to inform the design of future mechanisms supporting the attainment of mutual awareness in IM applications.

2 Related Work

IM systems are near-synchronous communication tools that facilitate one-to-one communication between a person and their 'buddy list' by supporting an exchange of short textual messages. The near-synchronous nature of the tool allows for communication to be paced according to the preferences of both communicators. The great success of IM can be attributed to its flexible nature [20] and low cost of interruptiveness [15]. However, as the use of IM is growing, particularly at work, the insufficient support for managing people's availability for communication tends to lead to communication breakdowns, which, in turn, can have negative effects on the social relationships between the system users [4]. The aforementioned problem is not new and a vast body of research was conducted in that subject [26, 3, 4, 18, 2, 34].

Prior works have shown that managing availability for communication is a dynamic and multidimensional process that depends on the continuously changing context [6, 13, 27, 4] and that technologies supporting mediated communication often disrupt the exchange of cues regarding that context [27]. Volda et al [34] observed that, in IM systems, while it might be convenient for the sender to initiate a conversation at a particular moment, it may be undesirable for the recipient to engage in that conversation at that moment. The recipient must then face a trade-off between continuing his/her current task and engaging in communication. Nardi et al [26] saw that information exchange can be successful only through subtle negotiations about availability as a way to establish connection by inhabiting and maintaining a shared communication zone. The process of negotiating availability binds people more tightly together for a specific interaction as they establish a particular attentional contract and is likely to have consequences for future communications. Dabbish and Kraut [10] argued that providing cues about recipient's availability prior to communication initiation should offer a good prediction regarding the likelihood of accepting that communication and might even indicate how communication could proceed.

In the context of negotiating communications, the ability to provide awareness regarding availability status should be seen as one of the most important features of IM clients. They typically provide relevant information by indicating whether a user is online and whether (s)he is currently active or idle by measuring keyboard activity.

Most IM clients also allow users to signal whether they are busy by entering short status messages that remain visible in the ‘buddy list’ view until changed or deleted. Szostek et al [29] showed that such contextual status indications are likely to allow communicators not only to see that their buddies are unavailable for communication but also to understand why they are unavailable. However, such manual solutions, although considered as rich and at the same time providing sufficient space for ambiguity, are imperfect: people tend to forget to update them when their situation changes [24, 29, 1]. Therefore, many works concentrated around designing systems deriving one’s communicative state based on automatically detected availability cues [7, 6, 14, 31, 32, 30]. Availability indications were provided through video-streaming [11, 22], by representing the content of agendas or daily rhythms [7, 6, 32] or by showing computer activities and various sensory data captured from people’s environments [13]. Evaluations of many systems showed, however, that presenting availability status alone appears to be insufficient for screening unwanted interruptions [7, 6, 31]. The study by Szostek et al [29] argued that it is crucial to introduce mechanisms stimulating mutual, reciprocal awareness regarding communicative needs of both the initiator and the recipient.

So far various mechanisms were designed allowing initiators to ‘grab’ recipient’s attention through the use of various audio-visual alerts and alarms generally accessible in any IM client. Hsieh et al [18] and also Tang et al [33] recently showed that tagging of IM messages might be a valuable way for the initiator to indicate the importance of an incoming communication. However, as noticed by Nardi and Whittaker [25] an asymmetry can be seen in tools supporting mediated communication, where the initiator tends to have more control over the communicative exchange comparing to the recipient. Therefore, in this study, we focused on investigating attainment of a desirable level of mutual awareness regarding the communicative state of the recipient by attempting to answer the following question:

What is a successful way to achieve mutual, reciprocal awareness of recipient’s communicative state in IM systems?

We aimed to answer this question by investigating the extent to which people were willing to comply with the availability status of others when provided with status indication during conversation initiation. Also, we looked into the possible effect of different status indications on their decision to initiate communication. Moreover, we were interested to see whether the mutual awareness of the recipient’s status provided participants with a way to discard poorly timed communications. Finally, we aimed at eliciting design implications that help improve the attainment of the mutual awareness in IM systems.

3 Design

The Do^{NT}Bother system was implemented in Java and based on an open source Jabber client: JBother [37]. We chose JBother as it allowed for transport registration, so that participants could integrate their MSN client with the prototype and receive all IM

messages through one unified application. In this way we wanted to lower the acceptance threshold for Do^{NT}Bother and assure that participants had the possibility to integrate all their contacts and to execute all their communications through Do^{NT}Bother rather than using many separate IM applications.

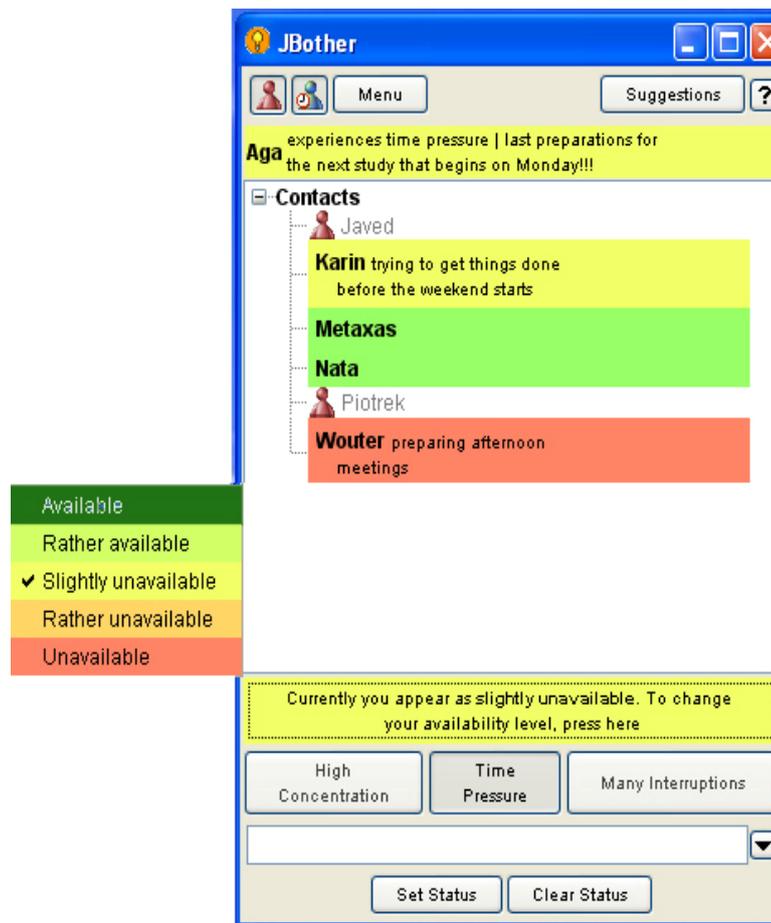


Fig. 1. Availability status representation consisting of: a expandable menu for indicating the *availability levels*, three *status buttons* and a text box to enter a *status message*.

Based on the findings by Szostek et al. [29] we equipped DoNTBother with the following means of indicating its users' communicative state (see: Fig. 1). Participants could set their availability level on a 5-point scale ranging from available to unavailable and represented by colours spanning from green to red. Furthermore, they have at their disposal three status buttons ('Concentration', 'Time Pressure' and 'Many Interruptions'), each generating a predefined message ('Ann is concentrated', 'Ann experiences high time pressure', and 'Ann experienced many interruptions').

Finally, a text box was added in which a personalized status message of one's availability state could be entered.

The main difference between DoNTBother and conventional IM systems was that DoNTBother, besides showing contextual status information in the 'buddy list', also showed that information in every newly opened chat box. In such a way both communicators gained the opportunity to attain mutual awareness of the recipient's communicative state. DoNTBother provides two ways to achieve that (see: Fig. 2):

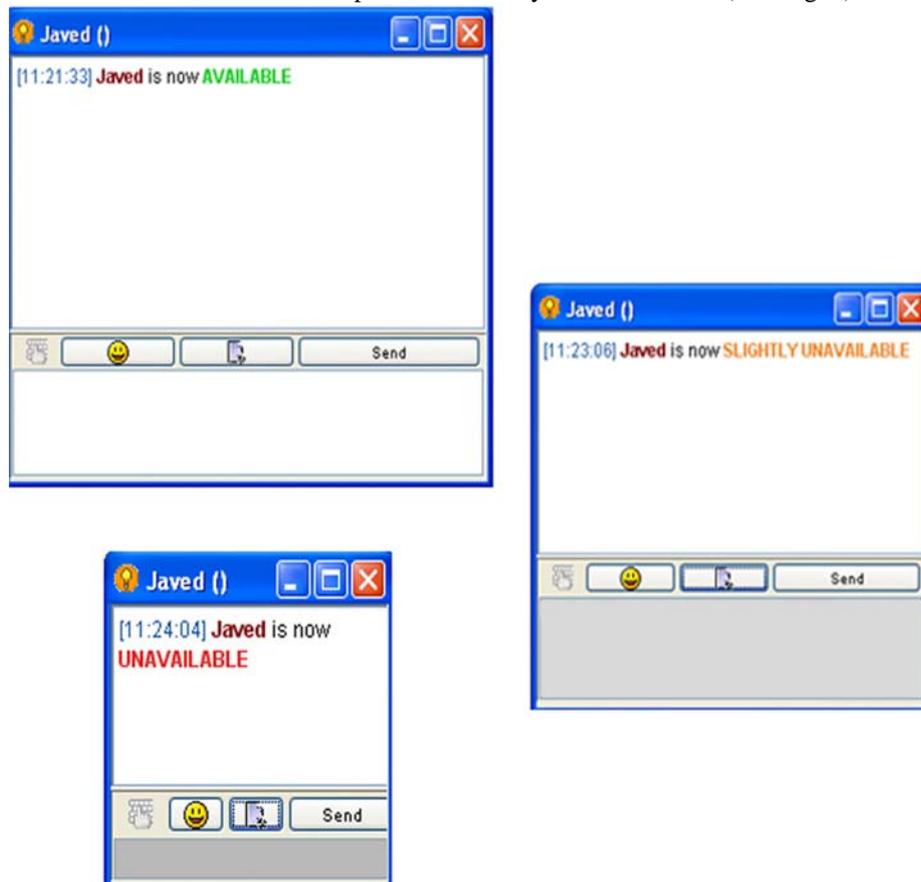


Fig. 2. Displaying recipient's status during communication initiation: a textual and graphical status update in the chat box.

1. A textual status update: the recent recipient's status (including the availability level and the status description) was shown as a line of text appearing on the top of the chat box of a newly initiated IM conversation, so that both communicators could see it before engaging in a conversation. The colour of the text reflected the colour coding for recipient's current availability level.
2. A graphical status update: any newly open chat box changed its size depending on the availability level indicated by the recipient, so that it opened in full size if one indicated full availability and obtained a gradually smaller size if the

status is set to the consecutive levels. Furthermore, the entry space of the chat box gradually changed colour from white to grey depending on recipient's availability. Change in the physical parameters of the text entry box was intended to indicate to the initiator the possible cost of initiating communication. Nonetheless, the user was in no way prohibited from entering the text of any length. If necessary the chat box could be enlarged by dragging its right-bottom corner and the background colour could be changed by using the background-colour palette. Note that as soon as the reply to a message was received (meaning that the recipient showed interest in engaging in a conversation) the chat box returned to its original size and colour.

4 Participants

Ten employees (2 female) from a web design company, employing 35 people in total, agreed to participate in the study. Based on the data provided through the demographics questionnaire distributed prior to study initiation we noted that all participants were acquainted with at least one IM application (mostly MSN). An IM application was used only for professional purposes by 5 persons. The remaining participants used the IM for both professional and personal communications. 8 participants reported to use IM daily and 2 to use it a few times a week. Only 1 participant frequently updated her status, 6 did it sometimes and 3 persons never set their IM status before.

4.1 Study Setup

The system was presented to the participants during a one-hour presentation before the study initiation. All participants received a software package allowing them to install DoNTBother and also to integrate it with their other IM contacts. They were also provided with assistance during the application deployment and received a three-page document instructing them how to access features available in the system.

The study lasted three weeks (the first study week was treated as introductory and data collected during that week was removed from the dataset). Participants used both textual and graphical way of representing the recipient's availability status simultaneously. In such a way they could experience the proposed solutions and determine their preferences regarding both design proposals.

After the study completion, in two Focus Group sessions, participants were asked to compare the DoNTBother system to other IM systems with respect to: (i) ways to indicate communicators' availability status, and (ii) ways to stimulate mutual awareness of that status. Both sessions consisted of 5 participants. Each session lasted approximately one hour, was audio recorded and transcribed.

4.2 Data Analysis

In this study data was collected from two data sources. The summary of participants' interactions was intended to illustrate the relationship between their availability status and the initiated communications. For that purpose, we recorded the following data:

- time of communication initiation
- recipient's availability status at the moment of the initiation
- whether the initiation was executed or not
- whether the initiation was responded to or not.

The recipient's availability status at the moment of communication initiation was aimed to show the extent to which participants were willing to comply with the indicated availability status of their colleagues. The data about whether the initiation was executed gave insights into the possible effect of the status indication in the chat box on the decision to initiate communication. The data about whether the initiation was responded to showed the extent to which the mutual awareness of the recipient's status provided participants with an opportunity to discard poorly timed communications.

The analysis of the Focus Group sessions aimed at providing qualitative insights into participants' opinions and preferences regarding using the representations of the availability status as means to negotiate communication in IM systems. For that purpose, the transcripts from both sessions were analyzed using the Direct Content analysis [19]. 145 statements were coded by two independent coders in two iterations (Fleiss K = .82 [28] for the first iteration and Fleiss K = .91 for the second). In the analysis 47 statements were categorized as expressing participants' observations regarding the differences in setting the availability status between DoNTBother and other IM tools (specifically MSN). 69 statements reflected their opinions regarding attaining mutual awareness of the recipient's availability status. 39 statements were classified as providing inadequate motivation for expressed opinions (e.g., 'It all is just personal') and were removed from the data set.

5 Results

In this section, we describe the results from the two data sources. The summary of participants' interactions aimed at illustrating the ways they tended to initiate communications for different availability status indications. The analysis of the Focus Group sessions provided qualitative insights into subsequent participants' opinions regarding the advantages and disadvantages of DoNTBother in comparison to other IM applications, especially regarding ways of both presenting the availability status and invoking mutual awareness about that status.

5.1 Logs

During the study 173 communications were recorded (approximately 2 conversations per person per day). 73% of these initiations were commenced when participants'

availability was indicated as available; 6% as rather available; 10% as slightly unavailable; 10% as rather unavailable and only 1% as unavailable. Such a result shows that, in general, communicators were willing to initiate communications at right moments based on the status information presented in the 'buddy list' view.

Interestingly, 30% of communication initiations recorded during the study were never responded to (n = 52). No relationship, however, was detected between lack of response and the availability status. Majority (n = 43) of unanswered communications were initiated when the recipient's status was indicated as available. From that observation we concluded that sending a message when the recipient appeared available did not necessarily guarantee receiving a reply. There might have been two reasons for lack of response: either the message itself did not require any or that the status indication visible in the system was not up to date and therefore the recipient was not able to answer the message. A detailed analysis of IM conversations would support further analysis of that observation.

Finally, we recorded 25 events, during which a chat box was opened but no communication was initiated. Majority of these events occurred when the recipient's availability status was other than available (for Level 2 - 6 cases, for Level 3 - 6 cases, for Level 4 - 2 cases and for Level 5 - 3 cases). This result shows the possible positive impact of the status update in the chat box on increasing awareness regarding the recipient's status at the point of communication initiation. Participants seemed to find additional means for verifying the communicative state of their colleagues and sometimes decide to withdraw from initiating communication when that status was set to somewhat unavailable.

5.2 Focus Groups

In the final part of the study opinions of ten participants added to our understanding regarding to what extent participants were aware of their communicators' availability status at the point of communication initiation.

Presenting Availability Status. Participants appreciated DoNTBother for allowing them to present their availability status in three different ways. The threefold way of defining one's status was perceived as providing an acceptable description about one's communicative state and at the same time as a way to disclose limited information about oneself (e.g., by only indicating one's availability level without providing any explanation of that level) or to exaggerate one's status (e.g., by setting the availability level to red and also pressing all status buttons). Different features allowed participants to control the amount of information they wanted to share with their colleagues. In line with findings by Nardi et al. [26], also in this study the system users reported to frequently use DoNTBother to check the status of a person whom they wanted to get in touch with through different communication means (e.g. Face-to-Face or through the phone).

'I think that what DoNTBother system has, as in opposite to MSN, is that it allows you to quickly tell others how busy you are and also on different levels, so not just only 'busy' or 'not busy'.'

'Success of Do^{NT}Bother comparing to MSN is the way it allows me to set my status. You want to give others a correct feeling of what's going on with you. In a face-to-face situation if someone comes and I'm busy I give him a dark look and he should turn around and go away. In Do^{NT}Bother I set a very strong status.'

The status indication did not always stop participants from contacting their colleagues in situations, in which they appeared unavailable. Participants based their decision of whether to interrupt or not on their knowledge regarding the current task of a co-worker. That knowledge was often supported by the status message stating the project a recipient was occupied with. Interestingly, we observed that a decision whether to interrupt someone or not was also based on how trustworthy the status appeared to the initiator. If the status indication seemed believable, participants were more likely to respect it. Participants considered as believable status indication that matched their own knowledge of another person's working situation (which was further rooted in their knowledge of others' workload derived from the fact of sharing a common physical space). However, whenever participants had doubts regarding status reliability they would easily discard it and initiate communication. Participants tended not to believe a status indication that seemed as intentional exaggeration or accidental overlooking to provide an updated value of one's communicative state.

'I find it handy when people set the status using messages so that I know that she is working on project X and she is really unavailable. Then if you are in the same project you know how to behave. I know that she is available for me. So any feature for setting the status and also for letting people know what they are working on is great.'

'Some colleagues would set their status to unavailable from 8 a.m. to 5 p.m. If I checked it a few times, I would think: 'I don't believe that you had so many interruptions already at 8 a.m., you just pressed all buttons'. And I would contact him anyway.'

Invoking Awareness of the Recipient's Status Among Communicators. Many participants considered both the textual and the graphical status update in the chat box as a successful reminder prompting them to either postpone communication or keep it short in situations when the recipient indicated limited availability. Participants felt that the status in the buddy list on its own was insufficient to assume that the communicator was aware of their communicative state. The textual status update was seen as a guarantee that one's status was seen and therefore one can use it as an excuse for delaying or deferring poorly timed communication. The graphical status indication was seen to counterbalance the possible negative impact that communication initiation could have on the recipient.

'If someone starts a conversation and gets my status, it is like a reminder: You started talking but I am under time pressure, so you should keep it short. And you can always ask this person to look at your status.'

'It was very handy that the chat box got smaller if someone was unavailable. Sometimes you don't really check if he is available, you just want to talk to him. And then you see the chat box getting smaller.'

Surprisingly, participants frequently reported misunderstandings regarding the meaning of sending a message at times when the recipient appeared unavailable. Often when participants sent a message to someone who displayed limited availability for communication they did not intend to compromise her need for solitude. Their goal was, instead, to indicate interest in communication. At the same time, initiators wanted to leave the initiative to the recipient as when to react to that message. However, while messages received at moments when the recipient was available could be easily deferred for later, those received while one's status was set to unavailable, were often seen as urgent and participants felt inclined to at least read and often also act on them immediately.

'If I see that someone is busy, I don't expect an answer right away. I already contacted him and it was enough for me to let him know what my problem is and that I would like a response sometime.'

'When my status is set to available and something blinks then I don't care. But when my status is set to unavailable and there is something blinking I think: 'It must be really urgent'. I will answer both, of course, but my curiosity is higher when my status is unavailable and still someone tries to reach me.'

Finally, although they appreciated the status update in the chat box, participants felt that Do^{NT}Bother lacked support for communication breakdowns caused by a change in communicators' situation that occurred in the middle of the conversation and was often caused by a trigger happening outside the application (e.g., receiving a phone call). Participants needed to be able to quickly put an ongoing IM communication on hold if another situation needed their attention but at the same time they wanted to quickly provide an acceptable excuse explaining why they went into an idle state.

'It is important to define who should come back to that conversation because it may end up in a situation that someone is waiting for you and you are waiting for him to continue.'

'How many times I wrote: 'Wait a minute, phone'. It is an interruption in my conversation with this person and I want to put him on hold but I also want to tell him that I will be back in few minutes. It is better if somebody knows what is going on. But it is also annoying to have to type in the exact same message over and over again.'

6 Discussion

This study aimed at investigating what is a successful way to achieve mutual, reciprocal awareness of recipient's communicative state in IM systems. The analysis of both quantitative and qualitative results comparing the DoNTBother system with existing Instant Messaging applications (specifically: MSN) showed that providing current recipient's status in the chat box encouraged participants to respect the communicative state of their colleagues during communication initiation. Similarly to findings by Begole et al [6], also in this study we saw that users did not always refrain

from initiating communications when their colleagues appeared unavailable. Therefore attaining mutual awareness about the recipient's status gave participants the opportunity to ignore untimely communications whenever necessary. The main advantage of the textual status update was its equal visibility to both the recipient and the initiator. Participants reflected that having the status message clearly visible in the chat box guaranteed that their communicative state was, indeed, seen by their communicators and provided them with the opportunity to use it as an excuse to withdraw from unwanted communication. The graphical representation was seen more as a 'defense mechanism' before the communication was, actually, initiated as it made the task of typing in the initial message more difficult. These findings confirm the importance of supporting reciprocal awareness that was already discussed by Erickson and Kellogg [12]. By ascertaining that all systems users know what information is shared among them people are likely to become more sensitive to the communicative needs of others and act in a way that is socially salient.

We can see that while the general idea of adding mechanisms to attain mutual awareness may seem to burden the IM users with additional effort when initiating communication, it should not be dismissed as these mechanisms bring clear benefits to the ways mediated communication unfolds. Such mechanisms, when well integrated in systems supporting mediated communication, are likely to provide several social benefits to communicators (like helping to formulate rules regarding when communication is desirable and when it is unwanted). However, for any awareness mechanism to be successful additional design implications need to be addressed: (i) support for indicating the time frame for answering a message in situations when the recipient is not instantaneously able to engage in a conversation, (ii) support for specifying the urgency of a message by the initiator and also (iii) support for indicating communication breakdowns especially if they are caused by a reason occurring outside the application domain.

The analysis of the results further identified a need for recipients to have the possibility to quickly and effortlessly indicate to the initiator when it is feasible to expect a response. Currently, the only way to delay conversations in IM applications is to temporarily ignore incoming communication, which then could stay up on the user's computer screen as a reminder [26]. Szostek et al. [29] reported that people wanted to be able to indicate to their colleagues that communication was poorly timed as a way to 'educate' them about the value of various availability indications. Wiberg and Whittaker [35] discussed that to avoid increasing of recipients' cognitive overload it is important to enable quick postponing of communications. Therefore, we argue that lightweight support for communication postponing could further support people in maintaining mutual awareness of their communicative state. Such a mechanism could resemble a 'Poke' functionality implemented in social networking applications like Facebook [36]. 'Poke' is a button that, once pressed, sends a predefined message to a selected recipient. A similar functionality deployed in an IM system could provide an effortless way to indicate to a colleague a delay in communication.

Moreover, the current study revealed the importance for the initiator to be able to indicate when a response to the message is likely to be expected. Mechanisms such as proposed by Hsieh et al [18] show their initial value in addressing this issue. The evaluation of their time and no popup tags showed their value as lightweight means to

coordinate the intended pace of IM communications. We agree with the authors that message tagging is likely to facilitate different activities occurring in the IM systems. We, however, think that such tags should not only be provided for the communication initiators but also for the recipients.

Finally, an issue of a lightweight way of indicating communication breakdown especially if the breakdown is caused by an external factor (e.g., an appearance of a visitor or reception of a phone-call) is important to address. Current work-around for people is to send an explanatory message like: 'I am on the phone' and then leave the conversation. However, such a method is perceived neither efficient (people seem to be typing very similar messages every so often) nor lightweight (typing in a message requires time and may be very inconvenient especially if there is a visitor around). One possible solution would be to support users in creation of a list of 'delay' messages; a sort of an 'excuse repository', from which typical responses could be easily and efficiently retrieved. In such a way people would be supported in maintaining awareness of what is the availability state of communicators throughout the entire conversation duration.

7 Conclusions

In this study we empirically investigated ways to attain mutual awareness of recipient's availability for communication in Instant Messaging systems. For that purpose we tested a prototype of an IM system named Do^{NT}Bother. The analysis of the results showed that providing status indication during communication initiation encouraged participants to show more respect towards the communicative state of their colleagues comparing to similar situations when the availability status was visible only in the 'buddy list' view. These findings confirm the importance of supporting the attainment of reciprocal awareness as defined by Erickson and Kellogg [12]. Moreover, this study points as the fact that mutual awareness needs to be maintained not only during communication initiation but also throughout the entire communication duration. Within that context the following design implications were derived: IM systems need to allow for indicating the time frame for answering a message. IM systems should also support specifying the urgency of a message. Finally, IM systems must support indicating the reasons behind any communication breakdown especially if the breakdown is caused by a reason occurring outside the application domain.

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