Supporting Emotion Communication in Information Systems

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Abstract

Society is becoming increasingly reliant on Information Systems to meet its everyday communication requirements, yet many current implementations lack support for important conversational cues. One such cue is emotion communication. Emotion communication carries with it many signals that affect our behaviour, the interpretation of the message and provide a catalyst to other forms of communication such as empathy and the formation of social ties. Emotion itself can affect the very decision to communicate, or the way in which one may respond to a given communication. To explore the ways in which systems may better support emotion communication between members of a social group, a cloud-based information system was developed and trialled which both large and small groups. This paper presents results on how Information Systems can best support emotion communication in social groups.

Keywords

Human-Computer Interaction, Affective Computing, Emotion Sharing, Mobile Technologies, Information Systems.

INTRODUCTION

The use of Email, instant message services and social networks have largely supplemented face-to-face communication as a common method of sharing messages, experiences and interactions. With the increase in the use of these systems, software and information system designers have an obligation to ensure that their systems support all levels of the communicative process.

Existing systems lack support for many of the cues found in human communication, at the expense of the message and overall interaction. For example, a text-based message sent via a social network lacks many of the communicative cues that would exist should that message have been shared in a different medium. A telephone call would contain additional cues such as vocal intonation. A face-to-face communication would include body language and gesture. In some cases, these other cues are fundamental to the interpretation of the message.

Emotion is an important cue in communication. With emotion comes communication of intention, cues to interpretation and rules to social engagement. Emotion helps us to form social ties, facilitate interpretation of a communicated message and allows for an intimacy in interactions that can be both stimulating and personal. Emotions exist in communication even from a young age. Infants can be observed as having positive reactions to a smiling mother, and negative reactions to displays of anger (Tronick 1989). Transmission of emotion forms a part of our interactions much in the same way as other forms of communication do. Communication without emotion is lifeless and leaves the job of interpretation up to the receiver, which can result in miscommunication of the intended message.

Emotion communication consists of many cues. Body language, vocal intonation and facial expression are just some of the cues that may be missing from a message transmitted using existing communication systems. In addition, existing systems do not consider other attributes to communication, such as purpose, group size and response, and how this effects emotion. Constructivists argue that emotions are a product of communication, and that they arise through a common discourse between a culture, society or group (Reddy 1997). Planalp (1999, pp 135) points out that “Most of our feelings are directly connected to situations involving other people, and so we communicate emotion about and with other people”. Emotion also allows us to communicate a shared experience, much in the same way a director does through an orchestral score during a film (for a discussion on

emotion and film, see: Plantinga and Smith 1999) or an artist does through the use of colour and brush stroke in a painting (for an example see: Metts and Planalp 2002).

Motivations to communication can vary. Communication not only exists for the purpose of the exchange of messages but also the formation of social ties and interaction. In order to behave correctly in a given situation, one must have an idea of the motivations of the message sender. For example, a message of "Help!" conveys very different meanings depending on the way in which it is delivered. One would act differently to receiving this message delivered with a shrill scream or a stifled laugh. Without the ability to accurately communicate the emotion alongside the message can make decisions associated to appropriate response difficult.

Emotion communication can also be a mediator to communication. For example, knowing the feelings of someone may cause you to initiate communication. In the same way, knowledge of an emotional state may cause one to avoid communication entirely. The strongest forms of communication involve the strongest displays of emotion, and the strongest emotions come from feelings of belonging related to love and loss (Baumeister and Leary 1995). People communicate to achieve social benefit and to express individuality. Planalp (1999, pp 148) states that "People enact, enhance, affirm, and deny their connections with other people by communicating emotion" highlighting that communication of emotion is a key feature of social relationships.

Research into emotion in Computer Mediated Communications (CMC) has suggested many varied positions on whether emotion communication can be adequately supported in this medium (for example, see: Derks et al. 2008). It has been shown however that cues to emotion expression can influence the communication behaviour between communicating parties and that medium can impact usage behaviour (see: Kato et al. 2007; Willis and Jones 2012 for some examples). Focus in current research has been on the support for communication methods that closely support those features found in face-to-face communication. This research investigates the use of these cues in online social networking systems and explores how the available cues are utilised by participants in making decisions about their communication and interaction behaviour with others in their social networks. Large and small groups are explored alongside desktop and mobile CMC interfaces as conduits for communicating emotion.

Current social networking systems focus on making the most connections possible, rather than making the most of the connections that already exist. Facebook (2012a) reports 901 million active monthly users and boasts that it's users have made more than 125 billion friend connections (as at March 2012, see: Facebook 2012b). Smaller intimacy groups (Lickel et al. 2000) require different levels of support to allow for intimate communications to take place. For example, the manner in which one shares personal information to their close friends using a more private medium (like via a phone call or SMS) differs from the types of information shared on existing social networks such as Facebook (Facebook 2012a) and Twitter (Twitter 2012).

Social networks need to support all facets of communication. Simply providing a medium to transmit messages is not enough. As these systems are becoming more widely used and replace traditional methods of communication (such as face-to-face), Information System practitioners should strive to support communicative cues to better facilitate interpretation.

THE EMOTISHARE SYSTEM

Emotishare was designed to allow members of a social group to share and respond to each other's emotional states. As a research tool, Emotishare allows for the controlled tracking of emotion state reports and responses between members of a social group. Functionality is intentionally restricted so not to distract the user or obscure the emotion message. Emotishare allows for the formation of social groups with the purpose of sharing emotional state, and facilitates methods of response to the reported states using external methods of communication.

In order to effectively investigate the research questions and meet research objectives, it was important to use a system that was able to focus on the communication of emotion without the distractions of other media and content. Existing social networking systems were evaluated, and were found to contain many distractions and ambiguity that could affect research results. While other networks are able to communicate state using similar methods as the system presented in this paper, they do so alongside a large amount of other content and to an already established large social group that may not be suitable candidates to the research. It was therefore decided that in order to provide a controlled environment in which an investigation can take place, a system would be designed and developed to provide a platform for it's users to share emotional state free from other distractions.

Emotishare is a cloud-based web application that provides both a web browser and a native mobile interface to the system. The system is comprised of the following components (see Figure 1):

- Emotion Report and Response Interfaces (web and mobile),
- The Emotishare Cloud Service (provides services related to the capture and sharing of emotion data between devices),
- Cloud-based data storage (provides data storage services and allows for the display of relationship data and historical emotion state data captured by the system).

The current version of the Emotishare system allows users to share 10 discrete emotion states. Each state is represented as a 'cloud character' similar to the emoticons found in other social networking systems. It was important to provide familiar representations so as to not overload the user or distract from the task of reporting an accurate state. The cloud characters were tested with the participant groups for recognisability and emotion labels were also provided to ensure that no confusion occurred when reporting or viewing the represented state. The 10 discrete states available in the system were: 'Happy', 'Admiring', 'Scared', 'Surprised', 'Sad', 'Disgusted', 'Bored', 'Angry', 'Frustrated' and 'Interested'; and were based upon Plutchik's Circumplex Model of Emotions (2003, see also Figure 2).

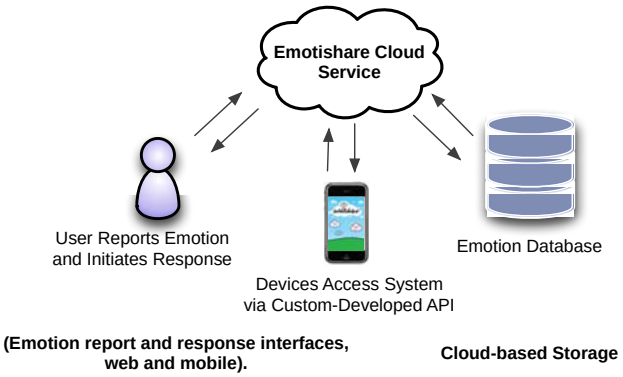

Figure 1: Emotishare System Diagram (Overview).

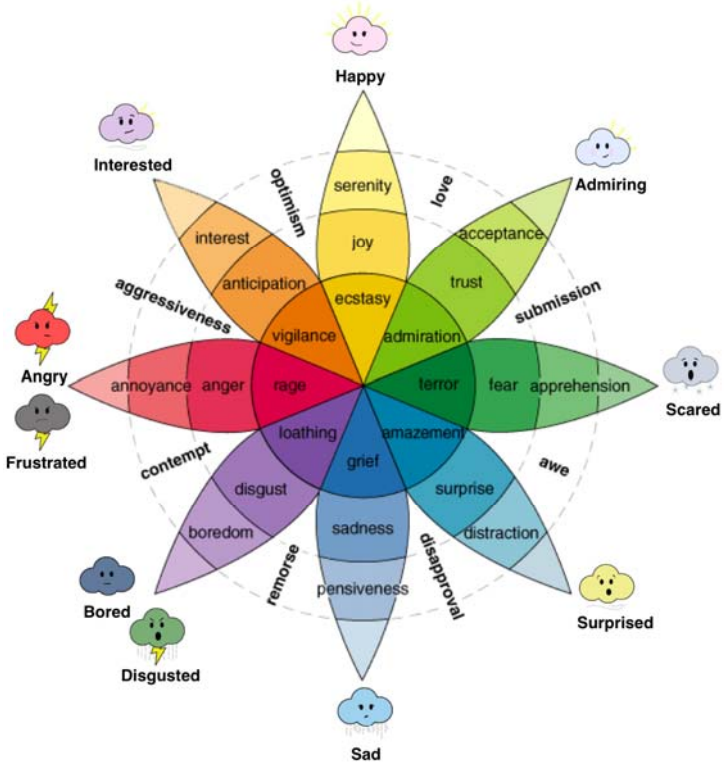

Figure 2: Emotishare Emotion Labels vs. Plutchik's (2003) Discrete Emotion States.

The formation of groups is facilitated through the use of a 'friendship system' in which users are able to request other users to enter into an online friendship with them for the purposes of sharing emotion state. Friendships are two-way and mutually exclusive. Both parties are required to accept a friendship relationship before one can be created, however only a single party has to end a friendship for both ties to be broken, and data is no longer visible to either party.

Web System

The Emotishare web application is a secure web site that allows users to log on and see the emotional states of others. When a user logs into the system, they are presented with the user dashboard (see Figure 3), which provides access to all of the features of the web system in a single interface. Users can view the states of their friends (see Figure 3, highlighted as star 1), set their own emotional state (see highlight 2), view friend requests (see highlight 3), respond to a friends emotional state (see highlight 4), and request friendships from other Emotishare users (see highlights 5 and 6). The Emotishare system also provides users with support information (see highlight 7) and allows the user to log off to keep their information secure (see highlight 8).

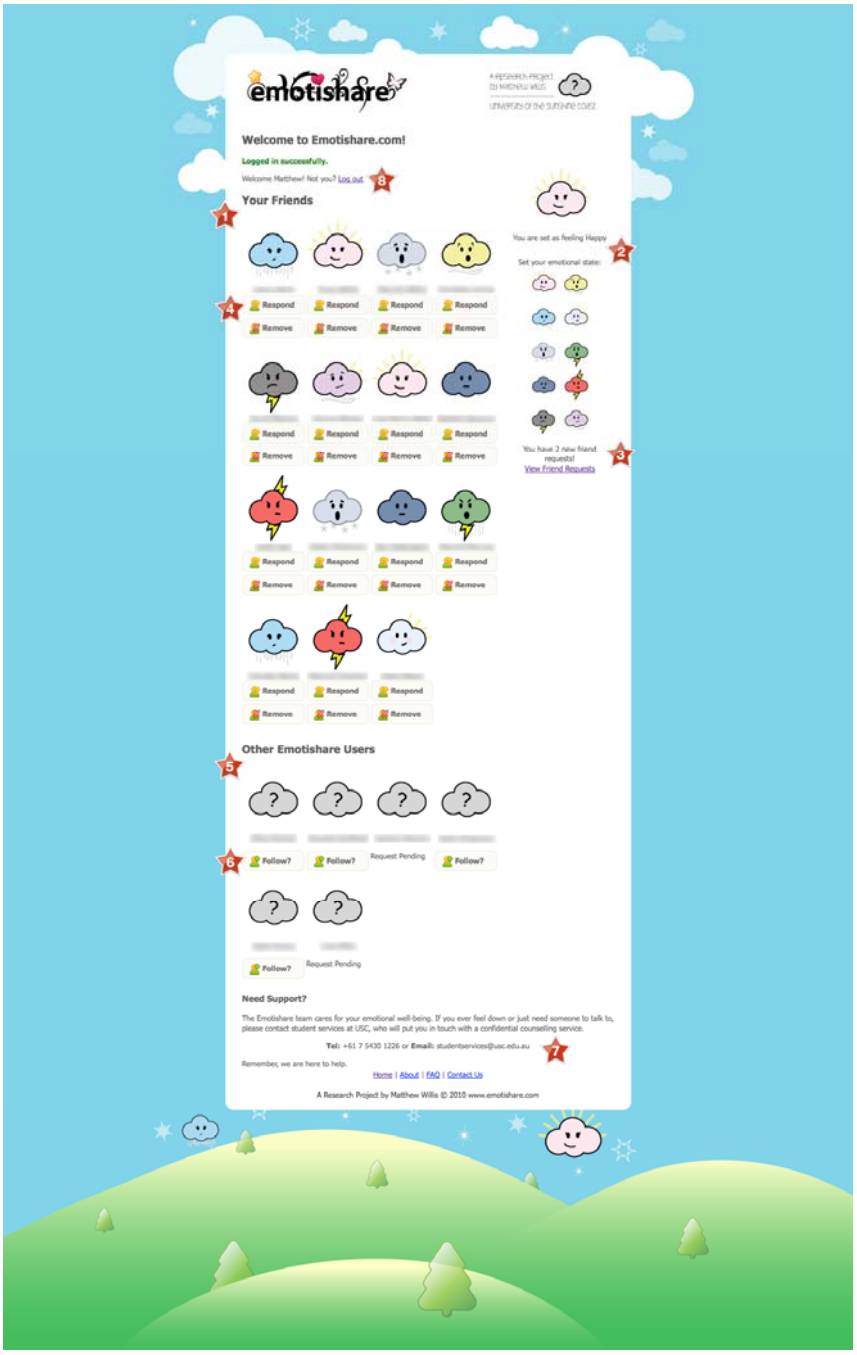

Figure 3: Emotishare Web System Interface. Highlights refer to points in text. Names have been intentionally blurred to protect the privacy of participants.

Mobile System

The mobile application provides users with a native iOS application that they can use on the Apple iPhone. The mobile system offers all of the functionality of the web-based system, with the addition of a text-based message to a friend request. The mobile application presents each feature available on its own tab (see Figure 4). The mobile application also provides direct access to the iPhone's functions (such as Phone, SMS and Email) to allow users to respond easily to others after viewing emotional states.

Figure 4: Emotishare Mobile System Interface (examples). Names have been intentionally blurred to protect the privacy of participants.

RESEARCH OBJECTIVES

The aim of this research is to investigate the phenomenon of emotion sharing in online social networks. This paper presents some of the results of this study, focusing on the implementation of Information Systems and their role of supporting emotion communication in large and small online social networks (for more, see: Willis 2011; Willis and Jones 2012). The following research questions (RQ) were considered in this explorative study:

RQ 1 asked 'How do people emote using online social networks?'

Participant groups were surveyed on their use of existing social networks, and their usage was recorded using the Emotishare system. The emotion reports were recorded during use of the Emotishare system, to provide an indication as to the scope of emotions that people may be willing to share online. Emotional expressiveness was also tested using the Emotional Expressiveness Questionnaire (King and Emmons 1990) and the Affective Communication Test (Friedman et al. 1980) to determine if an individuals emotional expressiveness has an effect on their usage of the Emotishare system. Finally, two types of medium were tested (a web and mobile interface) to determine the impact of pervasive ubiquitous technology on the emotion report and response behaviours of participants using each technology.

RQ 2 asks 'How do people respond to an emotional state when viewed in an online social network?'

Participant groups were surveyed for the types of emotions they are most likely to respond to using different mediums. Emotion responses were tracked in each interface (web and mobile) of the Emotishare system alongside the method used to respond to each state. These methods were used to discover if some states are more likely to attract a response than others, and which response methods were more likely to be used to make the response.

RQ 3 asks 'Can use of Emotishare enhance human communication through computer-mediated technologies?'

The ability to know the current emotional state of a person in your social network is a novel concept that has not been widely explored. In addition, it is not clear how constant knowledge of the emotions of others in your

social group would affect the communicative process. Participants were surveyed and interviewed to discover how they used such information in their communication choices, both facilitated through technology and otherwise.. Participants were also queried as to their preferred medium to report and respond to emotion.

RQ 4 asks 'Can use of Emotishare support an increased level of emotional empathy?

Empathy is an important part of emotion communication. This project investigated how access to the emotional states of others impacted upon feelings of empathy, and whether prior access to emotional state affected communication behaviour.

RQ 5 asks 'Can instances of emotional contagion be observed within the Emotishare network?'

The ability to map the emotional states and the responses to those states in an online social network provides the opportunity to investigate evidence of emotional contagion. Emotion reports and responses through the Emotishare system are recorded, and were 'replayed' to determine if any patterns of emotional contagion were observable.

EXPERIMENT DESIGN

The Emotishare system was trialled with a single large group and three smaller (intimate) groups. Participants in the large group trial were selected using a convenience sampling method (as defended by Lull (1990)). Only the web system was used in the large group trial. The trial activities consisted of two surveys (one at the beginning and one at the completion of the trial period), and 4 weeks of system usage. A total of 83 people completed all of the trial activities.

Small (intimate) groups were used to test both the web and mobile versions of the system. Intimate groups were defined as those social groups that contain small groups of people who have strong ties or bonds (such as close friends or family). These groups have been identified and termed by Lickel and colleagues (Lickel et al. 2000). Three intimate groups participated in the study. Two groups alternated between the two interfaces of the system (web and mobile) while the third provided a control group. Participants were members of a Mother's Group (social support groups designed for first time mothers) located in Sydney and the Central Coast of New South Wales, Australia. Each group consisted of less than 10 members, met once per week (in person) and used social networking services (such as Facebook (2012a)) to communicate at other times.

The system trial lasted for 5 weeks. Participants accessed the web system using their own computers. iPhones were provided to the participants for the mobile portion of the trial, and 1 week was provided to the participants to familiarise themselves with the device prior to being given access to the application. Each system was trialled for a period of two weeks. Surveys were provided to all three groups at different stages throughout the study to track data on their experiences while using each version of the system. A general survey was provided to the control group to monitor emotional communication without access to either system version. At the completion of the trial period, participants took part in a focus group activity to collect data on their overall experience.

RESULTS

Friendships

During the large group trial, participants were able to make and remove friendship connections at anytime as they saw fit. This allowed participants to control who had knowledge of their emotional states at all times. The average number of friendships formed by each participant in the Emotishare system was 6. A force directed graph (Fruchterman and Reingold 1991) was produced to visualise this network. Nodes closest to the centre of the graph represent centralised network actors (participants with a larger number of friendship connections), with less connected nodes (participants with less friendship connections) visible at the outer boundaries. The graph is presented in Figure 5.

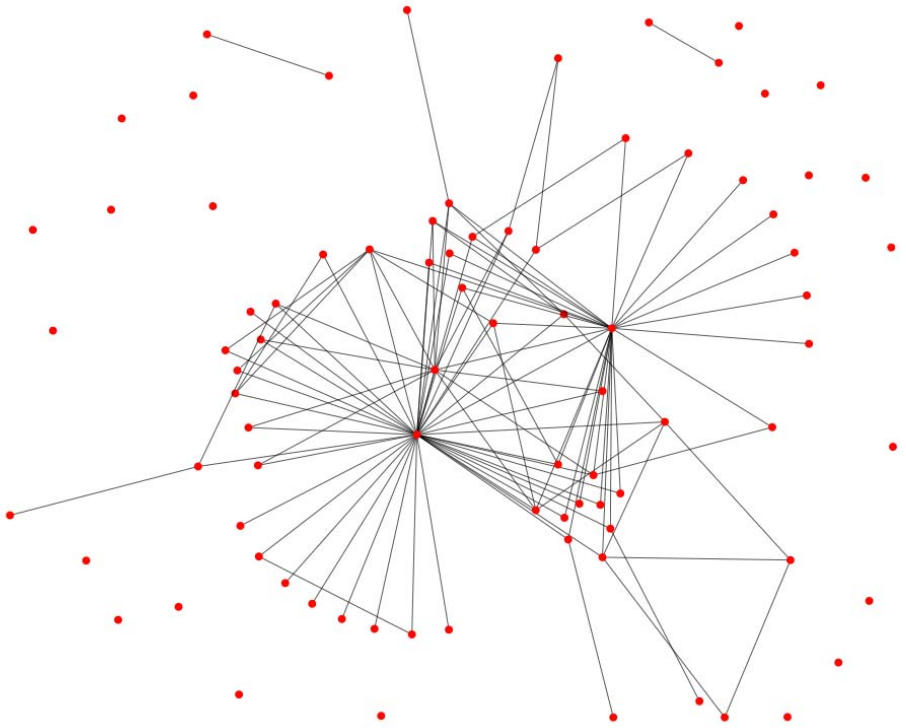

Figure 5: Emotishare Network Diagram (Friendships) – Large Group Trial.

Friendships for the small (intimate) group trial participants were setup prior to the trial period taking place with each participant connected to the others members in their mother's group. Participants were given the ability to remove a friendship connection if they chose to.

Emotion Report and Response Behaviours

Across both participant groups (large group and the small (intimate) groups) the most commonly reported emotion state was the 'Happy' state. This was followed by 'Interested' and 'Frustrated' for the large group, and 'Frustrated' and 'Interested' for the small (intimate) group.

A total of 109 responses (an average of 1.3 responses per user) to emotion states were recorded during the trial period for the large group. The most commonly responded to state was the 'Happy' state, followed by the 'Frustrated' and 'Interested' states respectively. Responder's states were most commonly set to 'Happy', followed by 'Frustrated' and 'Interested' when making the response. The mean average response time between an emotion report event and a response being recorded for that event was 119 hours. However, a median of 53 hours and a skewness statistic of 2.01 suggests a positive skew to the data. The majority (60%) of the recorded responses occur between 1 and 30 hours since the emotion report. The most commonly used method to respond was 'Email' followed by 'SMS' and 'Phone' (voice call).

A total of 105 responses were recorded during the small (intimate) group trial (for an average of 11.7 responses per user). The most commonly responded to state was 'Frustrated', followed by 'Happy' and 'Sad'. The state of the responder was most commonly set to 'Happy' followed by 'Frustrated' and 'Bored' when they made a response. The mean average response time between an emotion report and a response was 60 hours. However a median of 24.29 and a skewness statistic of 5.36 show a positive skew to the data. The majority of responses (77%) occur between 1 and 27 hours since the emotion was reported. The most common method of response was 'SMS' followed by 'Email' and 'Phone' (voice call).

Web vs. Mobile Interfaces

The small (intimate) group trial involved the use of a web and a mobile interface to the Emotishare system. System usage was logged for each version of the system. As a part of the overall data collection strategy, participants were surveyed for their opinions on each version of the system, and the overall ability of the system to support emotional communication. Slight functional differences exist between each version of the system, for example the web system features multiple actions on a single page, while the mobile interface separates these

into a tabbed interface. While these minor functional differences exist, the data does provide insight to the variances between each system medium.

The mobile system accounted for 58.2% of all recorded usage activity followed by the web system with 41.8%. The most common activity carried out on both systems was the 'Checked Friend's States' activity, followed by 'Checked Own State' (mobile) and 'Set Own State' (web). The order in which the participants used the systems impacted on the recorded usage. For the participant group that used the web system first, 56.7% of recorded usage was attributed to the web system followed by 43.3% for the mobile system. In contrast, the group that began with the mobile system recorded 86.4% of usage attributed to the mobile system followed by only 23.6% for the web system. Medium did not impact the types of emotion reported by participants with one exception. Users of the mobile system more commonly reported the 'Scared' state than those using the web system. Medium did not affect response behaviours or response methods. Results from the survey activity indicated that participants were more likely to use the web version of the system to report emotion, however that they preferred the mobile version of the system for overall usage.

The ubiquitous nature of the mobile device and mobile application appeared to have an influence on the preference for using this type of system for sharing personal data. During the focus group, one participant suggested that: "I think the phone [app] you are more likely to be truthful, because it's a lot more personal, you know that nobody else can see it, it's your device…". Even though the emotion data shared was the same as that shared using the web version of the system, this participant indicated that the mobile device felt more 'personal' and that this was favoured for use over the web system.

In addition to overall feelings of privacy, participants offered explanations of whether emotion reports on Emotishare may be seen as more truthful or accurate compared to those viewed on larger social networks (such as Facebook). One participant stated that: "If it were a bigger group, there's colleagues, or there's family that you mightn't want to tell everything, but in a group where we are generally going through similar emotions, you are more likely to be saying, you know, 'I've had a shocker' or… something personal… and be truthful about it", Another participant agreed: "I would be more likely to go on Facebook and say I am fine when I am not, because I think its a big audience… whereas if I am on text message or Emotishare… I would be more honest".

When queried about general usage preferences of the system, one participant suggested that the mobile system was more suited to casual, ad-hoc use: "I didn't consciously think 'Oh, I need to go to the website and update how I am feeling', where on my phone, if I am flipping through my phone and then I saw it I was like 'Oh, I'll push that and see what's going on'… so the iPhone was much easier than the website".

DISCUSSION AND CONCLUSIONS

The results of this research indicate that an Information System is able to facilitate emotion sharing between members of a social group. Specifically, members of a smaller intimate group benefited from the use of the Emotishare system during system trials, with participants reporting that they were more aware of the states of others in their social group. Small group participants indicated that they were using the system to help them make decisions around communicating with others in the group. Overall, participants expressed a desire to know the emotional states of others in their group, however larger groups showed less inclination to share or respond to the emotional reports of others. These results have implications for the future design of social networking systems and information systems designed to facilitate the communication of emotion and the sharing of personal data. The results presented in this paper suggest that people are willing to share these types of information given the right environment and platform to do so.

Timeliness of access to the emotion data appeared to influence the perception of that data. For example, emotion reports received less than 24 hours before the report took place were perceived with more validity than those received after this period. Therefore systems that provide timely data to a user on emotion report events will be more successful.

Existing social networking systems focus on the formation of large numbers of social ties. This research indicates that there may be another market for social networking systems in supporting smaller more intimate groups. Where existing social networks reward large group memberships such as through the advertisement of the number of social ties one has on their profile page, the Emotishare system provides an intimate experience between small groups of people with the reward of the sharing of more private data. While the small group trial had their friendships set for them at the beginning of the trial, large groups were allowed to form their own groups for the purposes of sharing emotional state. The average group size formed was 6. This result is similar to that of Christakis and Fowler (2009), who conducted a study asking members of popular social networking sites how many friends in their 'friends list' were actually 'close friends'. The answer reported was an average of 6.6 (Christakis and Fowler 2009, pp 276). This result suggests that social networking systems designed around the sharing of personal data should target smaller and more intimate groups than the groups currently

targeted. This is a unique approach in the world of social networking systems, and one that should be further explored by Information System practitioners.

The interface to the platform may also be as important as the platform itself. The choice of communication medium was shown to impact the willingness of participants to share and respond to emotional states. Mother's group participants indicated a preference towards the mobile interface, and also suggested that the mobile interface provided a more appropriate and personal user experience. The mobile system may also be able to capture a larger scope of emotion reports than the web system due to the mobile device being more available to the user than a desktop system. In addition, the mobile system may benefit from the opportunity for more ad-hoc usage to take place due to the nature of interaction provided by the device. Research into ubiquitous computing (Bell et al. 2003) investigates the role of the computing device in our everyday lives, and suggests a movement away from traditional desktop style interfaces. This research has shown that this movement may also have implications for the types of data we are likely to share, and the willingness to do so.

FUTURE WORK

The Emotishare system shows that people are interested in personal data such as Emotional state, however that the information must be easily controlled and must suit a particular purpose. In this study, emotion sharing between first time mothers seemed appropriate, and participants were open to the idea of sharing their emotional state. The trial with the large group was less successful. Future research will determine what attributes of small groups exist that may impact their willingness to share this type of data in an online medium, and will investigate the use of the system with other group types.

One such group type that this research is yet to explore is that of groups in an organisational setting. Workplace relationships differ from those in our personal lives, and emotions can play different roles with those in our workplace (see: Fineman 2003; Fineman 2008). Capturing emotion state data on individuals connected in small intimate groups within an organisational setting would allow researchers to determine the emotional communication behaviours as it relates to the workplace. For example, how management decisions affect the emotional state of employees, and how emotions are transmitted between work units. Looking at the organisation as a whole, a system like Emotishare could demonstrate the emotional state of an organisation as a whole, which may be a valuable metric for company performance and planning.

Finally, the use of a notification system to enhance timeliness of the receipt of emotion reports may also have an impact on system usage. Future trials will investigate the inclusion of a notification style system to notify other in the group when an emotion report takes place, to determine if this has an impact on the response behaviours of participants.

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