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Citation for published version:
Gooch, D & Watts, L 2011, 'A design framework for mediated personal relationship devices' pp. 237.

Publication date:
2011

Document Version
Peer reviewed version

Link to publication

University of Bath

A Design Framework for Mediated Personal Relationship Devices

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Substantial numbers of people carry out intimate relationships at a distance. These people have to utilise a variety of communication technologies in order to maintain their relationship. Although a number of communication technologies have been developed to help maintain an emotional connection between remote couples, there has been no comprehensive consideration of the design space that these technologies are developed within. We present here a proposed design framework for intimate communication devices. The intention is to highlight the decisions designers have to make when coming up with new communication systems and provide a more formalised system for considering the issues involved.

Design Framework, Computer-Mediated Communication, Social Presence, Intimate Communication

1. INTRODUCTION

Our social and personal relationships are important; they are one of the things which define us. More people than ever find that changes in their personal circumstances result in physical separation from their loved ones for extended periods of time. They have to carry on their relationships at a distance which can severely test their emotional bonds and social well-being. In such circumstances, couples exploit a great variety of the available technologies to help maintain their relationship; from phones and emails to writing old-fashioned love letters or sending gifts through the mail. Whilst none of these can quite replace the emotional closeness of being with their partner, they each represent mechanisms for re-establishing presence at a distance to some small degree.

Social Presence (SP) is one way to describe this concept of emotional closeness. Defined as "the degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationship" (**?**)[p. 65], Social Presence is essential for supporting relationships at a distance. It can be thought of as the strength of feeling towards the other people in a communicative act.

Social Presence has in the past been treated as a fixed property of the medium being used to communicate. For example, face to face conversations would be assumed to have a higher level of Social Presence than email. Short et al. argue that it should be possible to rank media by how much SP they engender. The SP-is-in-the-medium idea is consistent with a 'sum of cues' view of Media Richness Theory but cannot account for relational phenomena such as hyperpersonal communication (**?**). Often forgotten, Short et al. also argued that task context has an impact on feelings of SP.

Other research has disputed the SP-is-in-the medium idea. **?** found that differences in spatiality in video conferencing led to differences in the level of SP. **?**, investigating asynchronous online discussion tools, note that the tone of communication affects feelings of SP. These findings can only be understood if SP is not only affected by communication medium.

? have demonstrated that when analysing telephone, face-to-face and Instant Messaging conversations for levels of SP, use of the telephone generated greater feelings of SP than the other media. Connell argues that SP must be formed to a level that is sufficient to complete the relevant task. **?** have also shown that relationship and communication medium

have an impact on Social Presence. This research suggests that the task, relationship of participants and medium are all involved in the level of SP experienced by interlocutors.

However, stating that communication medium has an impact on SP is not particularly helpful. We propose a design framework which is intended to explore why the communication medium has an impact. We have already seen studies which demonstrate that it is not a simple sum of cues concept (i.e. **?**). The design framework is intended to provide a resource for intimate communication device designers such that they can maximise the feelings of SP for any given device. It formalises the areas designers should think through before making important design decisions.

We propose that SP can be heightened by designing communication systems that directly try to support feelings of presence in relationships. A number of devices have been designed to this end but generally suffer from a lack in evaluation. It is currently not clear how to design such devices or what factors need to be considered by designers when trying to support relationships. The aim of this paper is to propose a design framework for the design and exploration of how communication systems can be designed to convey social presence in intimate relationships. This framework details what aspects of the communication medium are important when considering Social Presence.

2. THE DESIGN FRAMEWORK

The design framework is derived from existing literature, commercially available communication systems and research prototypes. We will briefly describe one such system, the Magic Sock Drawer, as this is used to illustrate a number of the factors in the design framework.

2.1. The Magic Sock Drawer System

The Magic Sock Drawer (MSD) system is a way of exchanging love notes between people across a distance. Each unit, consists of a tablet PC to write the note on and a mini printer to print received notes. The system is made up of two units. Sending a note on one of the tablets causes it to be printed automatically on the other unit's printer. The tablet PCs can not be used for anything else except sending the notes. The printers are intended to be hidden in intimate locations (such as a person's sock drawer). This means that the notes engender a sense of intimacy and are found surreptitiously.

The system has three software options, using handwriting, typing and a combination of the two, to produce the love note. The intention is to

investigate whether a trace of the human touch (e.g. using handwriting) has an advantage over machine generated fonts (e.g. typed).

Further details on the system can be found in **?**.

2.2. The Framework

The design framework is made up of 6 factors. These are a mixture of discrete and continuous factors which we consider to be of importance when designing for SP. These factors are:

1. Personalisation
2. Sensory Medium
3. Effort
4. Openness of the System
5. Metaphor of Use
6. Fleeting vs Realised Output

In addition to these factors, there are a number of extraneous factors which are related to, but not directly incorporated into, the communication medium. These will be discussed in Section **??**.

Having listed the proposed factors, we now take each in turn, explain the factor and justify its inclusion in the framework.

2.3. Personalisation

With the digitisation of much of our communication, one of the factors which is quickly being lost is individuality. Each individual has a unique voice and style of handwriting, things which are identifiable by people who know that individual well. In contrast, all email messages or typed letters look the same regardless of who the author is. This contrast is what the Personalisation factor encapsulates.

Although most systems now use standardised presentation (e.g. typed) there is no fundamental reason why this should be the case. While there is a case for it in terms of clarity and understandability, in terms of intimacy, abstracting out all personalised features is likely to be a mistake. Those systems which still use personalised features (such as face-to-face or telephone calls) are demonstrably higher in terms of Social Presence than those that do not (such as email or IM) (see **?** and **?**).

Both email and IM are entirely standardised; that is they have no personalisation features. There is however no link between being digital and a lack of personalisation features of the nature we are discussing (e.g. excepting font colour etc). The MSD is a case in point - despite being digital, the drawing

interface gave participants an opportunity to express themselves and embed personalisation features into their messages. This is one of the reasons why the drawn messages were preferred over the typed messages (see also Section **??**).

The inclusion of personalisation in the framework should make designers think as to whether a standardised approach is actually the best one and stop them from assuming that it is the only option. Everybody is an individual and our communication should reflect this.

2.4. Sensory Medium

One of the things that is often overlooked when talking about communication media is the sense that it uses to communicate through – sound, smell, taste, touch or sight. Although there are other senses – e.g. pain or balance – these 5 senses are the ones most used to communicate with.

When talking about the sense used to communicate, we mean the sense that a person uses to interpret and understand a message. For example, you listen to a telephone call (the sense used is sound), you read a letter (the sense used is sight). We are not talking about industrial design issues although we accept that they also have an impact on how people use a communication system.

Of current systems, nearly all commercially available systems use either sight or sound. Telephones primarily use sound; face-to-face uses both sound and sight; letters use both touch and sight; email uses sight. In intimate communication systems, there is a move towards investigating the use of touch, especially as so many co-located intimate behaviours are based on touch (e.g. hand-holding, hugging, kissing). For example, (**?**) have presented an air-inflatable hugging vest, (**?**) a thermal hugging vest, (**?**) a method of sending tangible love notes.

There are two important reasons for considering which sensory media to use. The first is that what you can say is constrained by the sense you are using. Therefore, considering which sense you are using, means you are also considering what messages you could send through the communication medium.

The second is the implicit meanings carried by a particular sense – for example, written messages tend to be informative, touch tends to be emotive. These are things which need to be considered when designing intimate communication systems.

2.5. Effort

Recent findings have indicated that the effort invested when into creating a message is appreciated by the recipient of that message. **?** found that elderly people in particular found that new communication media (such as email) devalued the act of communicating as the media were too easy to use. In comparison, sending a letter was perceived as harder to do and was appreciated more. These findings are supported by the MSD study. Participants preferred sending drawn rather than typed messages, due in part to the effort involved in creating that specific message.

Riche et al. proposed that making interfaces harder to use (e.g. creating barriers for use) would thus be beneficial as people would appreciate the effort invested by the author. This is true in a subset of areas but does run the risk of creating frustration with the system if done in an unnecessary manner. The MSD has demonstrated that it can be done in a way which is not perceived as being superfluous.

There has been an assumption in the HCI literature that ease of use is always good. The inclusion of effort in the design framework is intended to demonstrate, with examples, that this is not always the case. In certain circumstances, considering increasing the difficulty of communicating using a particular medium could be of demonstrable benefit.

We should note that having to invest effort in creating a message is not necessarily the same as making it *difficult* to create a message. It can be done by offering an opportunity to invest effort or personalisation. It is not difficult to write a letter but it does require a level of effort.

Effort can be deemed to be partly a social issue, partly a technological one. If we use the comparison between sending an email and writing a letter, the technological difference is that writing a letter arguably involves a larger degree of effort than typing out an email. However, an email can be sent instantly, whereas the letter has to be put in an envelope, addressed, stamped and then posted - all of which could be described as being part of the process rather than being specific to the technology (which is really writing). The question of effort then extends beyond the technologies involved but also encompasses the process of using the technology.

2.6. Openness of the System

The openness of the system describes who can communicate with whom when using the system. There are, in essence, four different ways openness can be characterised – many-to-many, many-to-1, 1-to-many and 1-to-1.

Many-to-many communication is the system that is most common in commercial systems. Given certain details, any number of people can contact you using the medium and you can contact any number of people back. For example, anyone can call your telephone (provided they know/guess your phone number) and likewise you can call anyone from your telephone. The same is also true of email and many other communication media.

A many-to-1 communication system allows multiple people to contact you, but in such a way that you cannot respond to multiple people. Intercom systems often work in this manner, whereby anyone can buzz your intercom but you can only talk to that person. 1-to-many is essentially a broadcast system (such as radio or TV) where 1 person can broadcast a message to many people who cannot respond. These are less commonly thought of when communication media are discussed in the literature as they are not really used for personal communication.

The final type is 1-to-1 communication systems. This means that only one person can contact you through the system and likewise, you can only contact one person. The MSD was specifically designed to incorporate this level of openness as a design feature. As a user of the system, only one person can send you a note (the person with the other MSD) and you can only send notes to one other person (the person with the other MSD).

With many-to-many systems, you never know until starting the conversation whether you will be talking to your bank manager or your partner as everyone can contact you through the same system. Although there may be cues to inform you – caller ID for example – you still need to engage with the message and remember a lot of information to know who is trying to communicate with you.

With 1-to-1 systems you immediately know who is trying to communicate with you as it can only be one person. The supposition is that this can help to increase the intimacy of the contact. If you already know who is trying to communicate with you, this gives the message a heightened level of intimacy as there is no doubt about where the message is coming from.

Trying to create 1-to-1 communication can be seen behaviourally in some many-to-many systems – some people create a granularity of somewhere between many-to-many and 1-to-1 by using separate telephones for business and personal use. This behaviour is carried out despite the technology, rather than because of it. We are encouraging designers to consider incorporating such ideas into the actual communication system.

2.7. Metaphor of Use

This factor concerns the nature of the message being sent through the communication system. A number of metaphors can be used to describe the various types of messages which can be sent. We will discuss four examples which describe the various positions that can be taken on this factor.

The first is to have a completely *abstract* communication system such as that presented by (**?**). This type of system requires the recipient to interpret the meaning of any message passed through the system. Kaye's system consisted of a desktop taskbar circle which changed colour dependent on how often the person's partner clicked on their circle.

The second approach is to augment an existing *artefact*. This type of system takes an existent artefact, such as a bed or a cup or a table, and supplement it with technology such that it can be used as a communication device. A good example of this is from (**?**), who present an augmented bed, fitted out with features to communicate with a partnered bed.

A third approach is to attempt to replicate a co-located *behaviour* over a distance. This concept takes a co-located behaviour – such as hugging, kissing or holding hands – and tries to replicate it over a distance. An example of this would be hugging at a distance as in (**?**) and (**?**).

The fourth approach is one based solely on exchanging *content*. These types of systems are intended to convey just information. There are many of these as most current commercial systems fit into this category - telephone calls, email etc. However, there is no fundamental reason why these systems can't be complemented by systems from the more esoteric categories we've presented here.

It is important to note that these approaches do not exist independently of one another. The examples given for *behaviour* focussed on hugging. However, the systems did not consist of a pair of arms around someone's waist which squeezed the person, a level of abstraction was used (either air pressure or temperature) to represent the hug.

2.8. Fleeting vs Realised Output

The last factor to consider is the nature of the output of the communication. The output of a communicative act is activity used to communicate. For example, the output of a telephone conversation

is the conversation, the output of a writing a letter is the letter.

These outputs can be classed as being fleeting or realised. A realised output is one which can be kept, something physical. Common examples are things like letters, text messages or emails. Fleeting outputs are those which happen for a period of time and then can never be recovered or re-lived. Common examples include telephone calls and face-to-face meetings. Some of these fleeting experiences could be recorded – recording a phone call for example – but there is still a difference in as far as the realised outputs were *intended* to be kept whereas recording a fleeting experience is keeping something in a form it was not intended for. Rereading a letter is substantially different to listening to a phone conversation you've recorded.

It is worth noting that a realised output is different from a tangible output – it is possible to have a fleeting tangible experience. To illustrate this, we can compare two tangible systems. The hug belts we discussed in Section **??** (from (**?**) and (**?**)) both create a fleeting experience (i.e. the hug) whereas the MSD (**?**) produces a realised output (i.e. the note).

The design implication of this is that if the communicative acts performed through the medium are intended to be kept or relived, it seems sensible to design the system to create a realised output. If relying on memory is what is wanted, a fleeting output would be more desirable.

3. EXTRANEOUS FACTORS

There are other factors that could have an impact on SP, but which are not directly incorporated into the communication medium. The first of these is whether the messages the system communicates are content or contact in nature. Contact systems are intended to form a phatic link, content systems to exchange information. Some systems can be directly classified - for example, the light system presented by (**?**) is clearly contact. In some cases though, it depends on how the medium is used. Contact systems cannot be used to communicate content; however content systems can be used as a contact system. This has been found in existing systems such as the MSD system (see (**?**)).

The second factor is the location of the communication activity – are you at home, at work, mobile? If it is in the house, whereabouts in the house? Where is the other person? The location of things are important, not least because of the context which surrounds the location. Talking to someone from your work telephone feels different to talking to someone from your home phone – even if the actual telephone is exactly the same. This is due to a myriad of reasons. There are two immediate reasons, both of which were explored in the Magic Sock Drawer investigation. The first of these is the intimacy of the location. This however was found to be less of an issue compared to the privacy of the location. The other reason was surreptitiousness, finding the messages at random times throughout the day.

As we have already mentioned briefly, privacy is a major concern with any communication system. Rarely built directly into the communication system itself, and thus not part of the framework, it is clearly related to concerns around communication and is worth noting as an extraneous factor. For any communicative system to succeed, users have to be comfortable with the level of privacy the system provides for them.

The penultimate factor is the speed of message exchange. How quickly the message is transmitted does not determine when the message is received. Some systems have an element of vagueness to them. For example, although the minimal time a first class letter in the UK takes to arrive is 1 working day, it can take any number of days to arrive. Likewise, an email can take milliseconds to actually send but it is unknown how long it will take until the recipient actually reads it. It is unknown how this impacts upon communication. The supposition is that an unknown time to arrival could cause a sense of anticipation (from both author and receiver) and thus strengthen the sense of intimacy.

The final factor is gift-giving. Much communication can be characterised as a process of gift giving (**?**). This creates a obligation to reply to messages, related in some ways to the speed of message exchanged and the messages involved. How much this affects the design of communication systems is unknown. For example, it is unclear whether having a system which does not allow instantaneous reply (i.e. limiting gift giving) would have a negative effect on the perception of the communication system. Conversely, allowing instantaneous responses might force an obligation to reply – and if a reply does not come, it could cause negative feelings. This factor needs to be further investigated to help designers decide what is best for their communication system.

In addition to all of the factors we have discussed in this paper, we should make clear that there is a huge amount of context surrounding every communicative act which is likely to have a substantial impact on feelings of Social Presence. Such things could include whether that person has had a good day at work; whether the weather is nice; whether the

people involved have had a recent argument. Such contextual detail is extremely difficult to gather, let alone formalise into a design framework. As such we need to acknowledge that even designing the perfect communication system will not result in consistently high levels of Social Presence or guarantee the success of the relationship.

4. CONCLUSIONS AND FURTHER WORK

We have presented here a proposed design framework for intimate communication devices. The intention is to highlight the decisions designers have to make when coming up with new communication systems and provide a more formalised system for considering the issues involved.

We have tried to validate the framework by discussing both commercial and research communication systems and how they relate to each of the factors, demonstrating that different decisions have been made by communication device designers with regards to each of the factors discussed.

There are two main areas of further work. The first is to extend and clarify the framework as what we have presented here is only a provisional framework. As work progresses on understanding the nature of social presence, it is anticipated that the framework can be refined. We also need to provide further evidence to support the framework as the evidence presented here is only based on an analysis of both commercial and research intimate communication systems.

A larger issue is investigating which design factors create systems which best support long-distance relationships. This is a substantial challenge given the variety of design decisions and the options within each decision. This is less a task for any individual but more something for the community as a whole to consider.

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