

# The Unbearable Lightness of Being There: Contrasting Approaches to Presence Engineering

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## ABSTRACT

The emergence and proliferation of email, mobile communication devices, internet chatrooms, shared virtual environments, advanced tele-conferencing platforms and other telecommunication systems underline the importance of developing measurement methods that are sensitive to the human experience with these systems. In this paper, we discuss the concepts of social presence and connectedness as complementary notions, each relating to a different set of media properties that serve distinct communication needs. We aim to broaden the scope of current presence technologies and applications, illustrating the various factors that play a role in establishing, enhancing, and enriching the experience of human connectedness through communication media. Based on existing literature, we discuss a number of user requirements for home communication and awareness systems. To make these ideas tangible, we finish the paper by briefly discussing the ASTRA project as a case study in designing and evaluating an awareness system for the home.

**Keywords:** Social presence, social awareness, human connectedness, telecommunication, calm computing, lightweight applications, user requirements

## 1. INTRODUCTION

Human beings are social beings. We have a fundamental need to communicate, to form, maintain and enhance social relationships. This well-known fact is illustrated by the massive success of recent communication media such as email, mobile telephony, and SMS, but the basic insight can be traced back to the days of Aristotle, or even earlier. Maslov's theory of human needs, formulated in the 1950s, illustrates that social interaction is essential to satisfying human needs at several levels, in particular needs for belonging, love, and esteem, although at all other levels the formation of social networks may facilitate the attainability and satisfaction of the various needs.

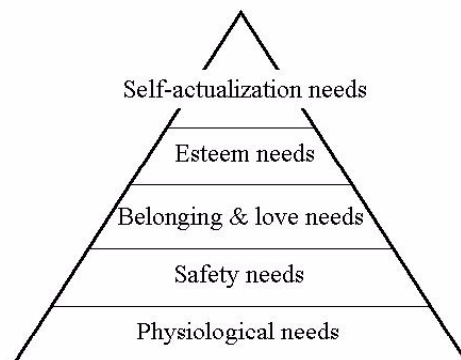


Figure 1. Abraham Maslow's pyramid of human needs

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Media technologies have significantly extended our reach across space and time. They enable us to interact with individuals and groups beyond our immediate physical surroundings. An increasing proportion of our daily social interactions is mediated, i.e. occurs with representations of others, with virtual embodiments rather than physical bodies. The extent to which these media interactions can be optimised to be believable, realistic, productive, and satisfying has been the topic of scholarly investigations for several decades – a topic that is only increasing in relevance as new communication media emerge and become ubiquitous.

In order to optimise the range of communication media for different users, contexts (e.g. home, mobile, work), bandwidths, and modalities, we need experiential metrics by which to judge the quality of the appliances, the services, and the interactions they afford. Several measures are already available that allow the assessment of functionality and usability. However, measuring the quality of the mediated interaction itself remains a considerable challenge. How is the mediated interaction experienced? Does it fulfil real communication needs? Does it resonate with the context and the specific user requirements? Does it enable a sense of connectedness, of belonging, of identification? Is it just as good as ‘being there’ face-to-face, or maybe even better? Or maybe it’s a different experience altogether?

We need a theory and measurement methodology that allows us to answer such questions. This clearly requires going beyond technology assessments, and into social psychology, sociology, ethnography, and philosophy of mind (see e.g. Biocca & Harms<sup>1</sup>). The concept of social presence, i.e. the sense of being together through media, provides us with a useful point of departure in this respect, but, as we will argue in this paper, the concept itself is intrinsically limited in its application, such that it cannot account for the whole gamut of experiences associated with communication technologies available today.

## 2. SOCIAL PRESENCE AND MEDIA RICHNESS

In their pioneering work, Short, Williams and Christie<sup>2</sup> conceptualise social presence as a way to analyse mediated communications. Their central hypothesis is that communication media vary in their degree of social presence and that these variations are important in determining the way individuals interact through the medium. Media capacity theories, such as social presence theory and media richness theory, are based on the premise that media have different capacities to carry interpersonal communicative cues. Theorists place the array of audio-visual communication media available to us today along a continuum ranging from face-to-face interaction at the richer, more social end and written communication at the less rich, less social end.

Richer media are traditionally considered to be those that enable the transmission and display of nonverbal communicative cues. In face-to-face communication, the nonverbal channels are continuously attended to and communicate information that is primarily affective in quality and connected with personal relationships. In this respect, the nonverbal channels seem to be less controllable than the verbal channels, i.e. they are more likely to “leak” information about feelings.

Argyle and Dean<sup>3</sup> argue that interpersonal intimacy is kept at an optimal, equilibrium level through factors as physical distance, smiling, eye contact and personal topics of conversation. Other scholars have added to this list of intimacy behaviours to include factors such as gestures, touching, vocal cues (e.g. tone of voice), turn-taking behaviour in dialogues (e.g. frequency of interruptions), the use of space (e.g. moving towards someone) and verbal expressions directly acknowledging the communicative partner (e.g. ‘How did you do that?’ or ‘I see what you mean’). Wiener and Mehrabian<sup>4</sup> have applied the concept of immediacy, i.e. the psychological distance a speaker puts between himself and the hearer, to an understanding of speech. They showed that the choice of ‘We...’ as opposed to ‘I...’ or ‘You...’ connote a feeling of closeness and association. Thus, supporting intimacy and immediacy behaviours seems to be particularly relevant for engendering social presence through media.

Biocca and Harms<sup>1</sup> have recently made significant advances in developing a more comprehensive theory of social presence. In line with most other definitions, they define social presence as a “sense of being with another in a mediated environment”. They continue their shorthand definition by stating that “social presence is the moment-to-moment awareness of co-presence of a mediated body and the sense of accessibility of the other being’s psychological, emotional, and intentional states” (p.14). Importantly, they distinguish three distinct levels of social presence. Level 1 is the perceptual level – primarily the detection and awareness of the co-presence of the other’s mediated body. The second, or subjective, level entails the sense that the user has of the awareness of the other, and the level of accessibility

to the others attentional engagement, emotional state, comprehension, and behavioural interaction. The third level is a dynamic, intersubjective level. It is comprised of the user's sense of the other's sense of social presence of them – i.e. the perceived symmetry of social presence. These theoretical concepts have been translated into a questionnaire measure of social presence that is currently being validated<sup>1,5</sup>.

### 3. FACE-TO-FACE AND BEYOND

The majority of tele-relating studies to date have focussed on audio- and videoconferencing systems in the context of professional, work-related meetings and computer-supported collaborative work (CSCW). Using such systems, participants typically appear in video-windows on a desktop system, or on adjoining monitors, and may work on shared applications that are shown simultaneously on each participant's screen. Examples include the work of Bly, Harrison, & Irwin<sup>6</sup>, Fish et al.<sup>7</sup>, and Gaver et al.<sup>8</sup>. As more bandwidth becomes available (e.g. Internet2), the design ideal that is guiding much of the R&D effort in the telecommunication industry is to mimic face-to-face communication as closely as possible, and to address the challenges associated with supporting non-verbal communication cues such as eye contact, facial expressions and postural movements. These challenges are addressed in projects such as the National Tele-Immersion Initiative<sup>9</sup>, VIRTUE<sup>10</sup>, and TELEPORT<sup>11</sup>, where the aim of such systems is to provide the remotely located participants with a sense of being together.

Complementary to this approach however, is the appreciation and utilisation of the considerable potential of communication media to provide features typically unavailable in face-to-face situations, such as saving the history of interactions, or changing the representation of self and others<sup>12, 13, 14</sup>. Clark and Brennan<sup>13</sup> have characterised different properties that communication media may offer (p.229): co-presence (A and B share the same environment), visibility (A and B are visible to each other), audibility (A and B can communicate through speaking to each other), co-temporality (B receives at roughly the same time as A presents, i.e. synchronous communication), simultaneity (A and B can send and receive at once and simultaneously), sequentiality (A's and B's turns cannot get out of sequence as in asynchronous communication), reviewability (B can review A's message), and revisability (A can revise messages for B). Interestingly, these properties indicate that face-to-face communication lacks opportunities offered by some telecommunication media. For example, reviewing a message before sending it proves to be difficult in face-to-face conversation, while email supports such functionality. In as much as these functionalities go beyond mimicking face-to-face encounters, social presence measures need to be complemented to properly account for the user experience in this regard.

### 4. STAYING IN TOUCH

A more recent focus of research in HCI and CSCW, influenced by previous work in Media Spaces<sup>6</sup> and Portholes<sup>15</sup>, as well as current trends in ambient intelligence, are awareness systems for use in personal settings – either home or mobile. Here, lightweight, emotional, informal forms of communication are being facilitated by systems that help people to effortlessly maintain awareness of each other's whereabouts and activities. Examples include the work by Hindus et al.<sup>16</sup> and Markopoulos et al.<sup>17</sup>. In line with Marc Weiser's notion of calm computing<sup>18</sup>, such systems can typically be always-on, yet be very gentle or calm in terms of attentional demands. When attention is asked, it should typically move from background to foreground in an unobtrusive manner. As the attentional demands are kept to a minimum, these systems should blend into the background and are effectively intended to be ignored until the user feels like communicating, i.e. asynchronous communication.

The aim of awareness systems is often simply to stay in touch, i.e. to be reassured about the well-being of others, to let others share your experiences, to let someone know you're thinking of him/her, or to create opportunities for synchronous communication. In other words, for this type of communication, the informational content of the message is of secondary importance to the emotional, relational content that is being transmitted. What is important to note here is that the concept of social presence may not be the best applicable experiential metric. In effect, when considering the theoretical framework described by Biocca & Harms<sup>1</sup>, outlined previously, the most basic level of perceptual awareness is almost absent. From a media richness point of view, awareness systems may be very poor, and social presence measured along richness dimensions will be low. Yet the sense of connectedness, the feeling of being in touch with the other can be strong and the experience highly appealing.

## 5. REQUIREMENTS FOR HOME COMMUNICATION AND AWARENESS SYSTEMS

The universal need to communicate is especially true for family members, who usually have strong social relations between them. Nowadays, many families are geographically distributed. Children move away from their parents to study or work. Once they have reached adulthood, brothers and sisters seldom live in the same house and often not even close to each other. When family members become geographically separated, their need to communicate does not diminish; it may even become stronger. When distance or time limits the frequency of face-to-face meetings, people have to rely on communication tools to maintain and strengthen their relationships.

In addition to traditional communication tools like telephone, letters and postcards, new technologies have provided people with a variety of means to bridge the distance between them. Computer-mediated communication tools like e-mail and instant messaging (IM) have quickly gained popularity and are now widely used. However, research has indicated that despite the availability of all these different media, communication and awareness needs are not fully satisfied<sup>19, 20, 21</sup>. There is still a great need to enhance the communication between family members who live apart.

We can distinguish two general purposes of communication: goal-oriented (coordination of activities or exchange of practical information) and social/emotional (casual chatting, exchanging of personal information, providing emotional support). Goal-oriented communication seems to be supported quite well by current communication means, but for social/emotional communication this is not the case<sup>22</sup>. This is unfortunate, since contacts of this type are crucial for maintaining social relationships. Why are current media not sufficient, and how can we improve them? To answer these questions, we have to identify remaining user needs and find requirements for new technologies to support staying in touch.

Literature provides us with several explanations for the shortcomings of current media. Kuwabara et al.<sup>23</sup> point out that there is an important difference between contents oriented communication and connectedness oriented communication. The first is focused on the exchange of information, whereas the second is targeted at maintaining social relationships and fostering a sense of connectedness between people. For this latter goal, the knowledge that someone has thought of you and made the effort to communicate with you is often more important than the content of the message. The authors explain that current communication technologies do not support connectedness well; they are too focused on content.

Markopoulos et al.<sup>17</sup> suggest that current systems lack an optimal balance between immediacy, relevance and obtrusiveness. Systems that are both immediate and relevant (e.g. the telephone) are mostly synchronous, and therefore intrusive. Unobtrusive, asynchronous tools, on the other hand, are less immediate and therefore less relevant. Another reason for the lack of support for social/emotional communication could be that several media, which are used for social purposes, were initially designed for use in industrial settings. The Internet, for instance, was developed for the exchange of information between professionals, but has now become a household technology predominantly used for interpersonal communication<sup>24</sup>. The possibility of usage in domestic settings, however, was not considered in the design process of such media, and therefore there is a mismatch between their affordances and the needs of home users<sup>25</sup>.

These considerations indicate that many of our new communication tools have not been designed with the appropriate application, actual end-user, and relevant context in mind. There is a gap between the offered functionalities and the real user needs. Instead of pursuing a technology-push approach in the home, it is necessary to look at the homes as they are now, and the communication processes that take place within and between households. Although many studies on communication and awareness have focused on office settings, some have also addressed the use of these systems in the home. Using varying methodologies like diaries<sup>26</sup>, interviews<sup>27</sup>, focus groups<sup>21</sup>, ethnographic methodologies<sup>19, 22</sup>, and prototype testing<sup>16, 23, 27</sup>, they have found many different requirements for communication tools. We will discuss a number of these requirements below.

### **Asynchrony and Unobtrusiveness**

Many CMC tools try to mimic face-to-face interaction by offering transparent immediacy. According to Washington<sup>21</sup>, there are several problems associated with this approach. First of all, it is quite difficult to provide a technology-mediated experience, which is as good as a face-to-face contact. Apart from the fact that technology currently has not developed far enough for this, users will always know that they are not really seeing, hearing or touching the other person. A second and perhaps even more important reason is that transparent immediacy can only be achieved by

synchronous communication means. A great disadvantage of synchrony is that attention of the user is disrupted<sup>23</sup> and users have to adapt themselves to the demands of the system<sup>21</sup>. For these and other reasons, several authors<sup>19, 26</sup> have identified the support of asynchronous communication as an important requirement for new systems. Users should be allowed to attend to the system in their own time, without being interrupted in the course of their daily life.

### **Appearance and Environment**

Communication tools for domestic usage should be nice to look at; they should have the appearance of a home decoration and blend in with the background, rather than stand out as a piece of technology<sup>26, 27</sup>. Also, the location of the tool in the home is important. Liechti et al.<sup>28</sup> have argued that the use of CMC tools can lead to social isolation, because they are often placed in a separate room. A solution for this would be to place communication tools in social areas of the home, like the kitchen or the living room. Another solution is to make communication tools portable<sup>22</sup>. Crabtree et al.<sup>25</sup> suggest that displays should be “ecologically distributed”; they should be placed in a way that they are merged in the normal flow of activities in the home.

### **Privacy, Control and Obligations**

Although people have a social need to share personal information with their family members, there are many personal experiences that they want to keep to themselves. New communication and awareness tools should respect this need for privacy<sup>16</sup>. It is especially important to let control remain in the hands of the users. They should be able to decide what kind of information they want to share, and with whom<sup>27</sup>. Users should also be able to control their own availability for communication; they should be able to indicate when they (don't) want to communicate and with whom<sup>22</sup>. For instance, with regard to video communication, Bouwhuis<sup>29</sup> found that the elderly population sample in the study perceived the video connection as a potential threat to privacy, in particular because the camera would be capturing private information not explicitly intended to be communicated, e.g. certain valuable properties, untidiness of the home or the clothing, presence of visitors, etc.

Providing people with new opportunities for communication can also give rise to new expectations. People can feel obliged to contact their family members, not because they feel a genuine need to do so, but because it is expected of them. Therefore, new systems should not create new obligations<sup>16, 21</sup>.

### **Awareness Information**

Awareness systems show information about the presence, status or mood of connected people. It can make people feel that they are not alone and trigger spontaneous interaction. How should this awareness information be captured and displayed? If many deliberate actions are required before a tool can be used, chances that people will use it decrease. Therefore, systems should either automatically capture awareness information or support lightweight manual input<sup>23, 30</sup>. On the side of the receiver, it has been suggested, that awareness information should be displayed in a symbolic, meaningful representation. It is better to let the receiver imagine the status of the other person rather than interpret high-fidelity audio or visual information, which will place heavier demands on attention and cognition<sup>23, 30</sup>. Finally, awareness systems should provide information not only about the present, but also about the past. Thus, it becomes possible to distinguish long-term trends<sup>27</sup>.

### **Personal Effort**

Despite the advantages of lightweight communication, we should not forget that often the effort of initiating a contact is appreciated more than the content of the message itself<sup>23, 28</sup>. So if communication becomes too easy, there is a chance that it will lose some of its value. However, there are different kinds of effort. There is effort associated with time and costs: buying a stamp or walking to the mailbox. This effort is not personal; it is the same for each sender and receiver; therefore we call it “process effort”. However, there also is a more personal kind of effort: choosing a specific postcard for someone, thinking of an original remark to write on it. We assume that this kind of effort has a higher emotional impact and can lead to a feeling of connectedness between the sender and the receiver. Therefore, new communication tools should be lightweight and easy to use, but take care to preserve personal effort.

## 6. ASTRA: A CASE STUDY

### User Study

The goal of the ASTRA project is to develop and evaluate a prototype that helps distributed family members to stay in touch with each other. We want to show that although CMC tools cannot replace face-to-face communication, they can help people to maintain and even strengthen their social relationships.

In addition to a literature study, we performed a user study combining interviews (17 participants) and a diary study (13 participants). This study confirmed that communication with family members is rated as very important and that strong communication needs exist between them, especially between parents and children, brothers and sisters, and grandparents and young grandchildren. When people choose to initiate a contact with a family member, they most often choose for synchronous communication tools: the traditional telephone or mobile phone. As advantages of these media, participants mentioned immediacy and easy access. However, there were also several disadvantages: they are perceived as intrusive for both the receiver and his/her environment, offer limited modalities, and create obligations.

Asynchronous tools that were used by our participants are e-mail, SMS, voicemail and postcards. What they like about these media is that the communication is on their own terms; both the sender and the receiver can decide when they have the time and they are in the right mood to communicate. They also like the opportunity to take time to think about a message and how they want to reply. Main disadvantages of asynchronous tools are a lack of immediate feedback, artificiality (voicemail), many required actions (e-mail and SMS) and, most importantly, impersonality. However, postcards are a positive exception. They are perceived as very personal, and are highly appreciated. Participants also liked the fact that they are permanent and therefore remind them of the other person. The only disadvantages of postcards are the amount of process effort (buying stamp, posting) and the substantial time delay between sending and receiving.

Additional requirements that emerged from the user study are:

- Participants want to share concrete information with each other, preferably pictures. This contrasts to the suggestions of authors cited above<sup>23, 30</sup>, as to the output form of awareness information.
- Asynchronous communication should be more personal.
- Participants want to have more possibilities for sharing everyday experiences with their family members.
- Social/emotional messages should be received in the home environment to give rise to feelings of connectedness.

### Design Idea: The *To Tell List*

Bearing these results and the requirements from literature in mind, we decided on two high-level goals for our design:

- Support social/emotional asynchronous communication;
- Stimulate and enhance social/emotional synchronous communication.

The system we have in mind will support the sharing of pictures, drawings and/or short handwritten messages. Messages can be recorded by a simple and easy-to-use mobile device including a digital camera and writing pad. These messages will be shown on displays in the homes of both the sender and the receiver(s). These home displays will also show awareness information about the status and availability of family members who do not live in the same household.

We will give a short scenario to illustrate this idea:

*Laura, a 20-year-old student, comes home from a day at the university. On her home display, she sees that she has received two messages from her father. The first one is a picture showing a horse, with a small handwritten message saying "my new horse has finally arrived!". The second message is a funny drawing. After dinner, Laura sees that her*

*father is available for communication, She decides to call him; she wants to hear all about his horse. She presses on his picture. The display shows all the messages that she sent to or received from him since their last contact.*

The system will allow users to easily record and share everyday experiences. Taking a picture or writing/drawing a message is not intrusive, and can therefore be used in situations where communication is currently not possible or desirable. Because the system is asynchronous, the receiver does not have to be available and is not disturbed in the course of daily life. Instead, the receiver can watch the messages in his/her own time, when in the right mood and in the comfort of the home environment.

We assume that this system will help family members to stay in touch with each other by reinforcing or enhancing a lasting sense of connectedness between them. By sharing experiences, they become more involved in each other's personal lives. Apart from the content of messages, the fact that the other person has thought of them also creates a sense of connectedness. Because messages are permanent (people can keep them as long as they like) and the system continually displays awareness information about others, people will be reminded of their family members. Furthermore, we assume that spontaneous synchronous communication will be triggered by the awareness information. The sent and received messages will provide content for synchronous contacts, thereby enhancing them.

### **Evaluation**

We are currently working on the implementation of a working prototype including the main functionalities of the *To Tell List*. We are also setting up an experimental assessment to evaluate it. We will observe at least two families using the system in both a home-laboratory and their own home environment. Besides observations and interviews, we will administer questionnaires. We will use the IPO-SPQ<sup>31</sup> to measure the level of social presence experienced when using the system. However, as explained before, we have some reservations; social presence may not be the best, or at least not the only concept for characterising this kind of communication. Since our system supports asynchronous communication, the feeling of being with the other person(s) may not be a very successful measure. We think that the most important affective benefit of the system will be a sense of connectedness, lasting throughout the day. This is quite similar to the concept of "affective awareness" described by Liechti & Ichikawa<sup>28</sup>: "a general sense of being close to one's family and friends. It seems that affective awareness is best achieved when people are engaged in shared experiences, especially when these experiences affect their emotional state".

In order to be sensitive to this dimension of human communication, we are currently in the process of developing a *Connectedness Questionnaire* that will not focus on the sense of being together as such (following the face-to-face model), but rather focus on the affective benefits of the awareness systems. Hypothesized affective benefits include a feeling of having company, a stronger group attraction, a feeling of staying in touch, of keeping up-to-date with other people's lives, and a sense of sharing, belonging, and intimacy.

In sum, awareness systems are not seen as replacing existing communication means, but rather as enriching them, strengthening existing social bonds and enabling new kinds of interactions. This calls for additional evaluation methodologies sensitive to affective properties of communication that go beyond the sense of being there.

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