

Chapter 11

Witnessed Presence in Merging Realities in Healthcare Environments

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Abstract. Witnessing is core to the design of social interaction. This chapter explores the role of witnessing from different perspectives. The first perspective focuses on witnessing in its social and psychological consequences. Response-ability, address- ability, the performance of testimony and transparency of subject position determine how individuals perceive/witness each other. The second perspective focuses on the impact of technology on witnessing and introduces the YUTPA framework as a tool for the design and orchestration of witnessing in technology environments. The third, fourth and fifth sections discuss initial results of exploratory research performed in the Netherlands and in India. This research shows that the way in which witnessing is orchestrated affects the psychological well-being of the people involved: it can be beneficial or detrimental. These results demonstrate the need to explicitly design witnessing along the four dimensions of the YUTPA model: space, time, action and relation. The sixth section addresses a third perspective, the technological perspective that focuses on the design of large scale socio-technological systems. The conclusion of this chapter argues that health systems that affect the psychological well being of the people involved must both be designed to take witnessing into account but also to be used appropriately.

Keywords: Witness, Technology, Presence, Healthcare, Cyber Therapy, Systems Design, Time, Place, Action, Relation, Trust, Collaboration, Socio-Technological systems.

1 Introduction

Today's virtual environments for healthcare, eg those created for cyber therapy and behavioural training, orchestrate social interaction. The real world and virtual world are often intentionally blurred through the use of technology. Therapist(s) and client(s) witness each other directly or indirectly by way of technology. The choice of technology and options for communication determines how people interact, how people perceive each other, how they can be witness to each other, and how they can take responsibility for each other and themselves.

In most of these systems, information about clients is only accessible to the therapists. The introduction of the Electronic Patient Files (EPD) in 2008,

approved by the Dutch Parliament in 2008, has changed the situation drastically. Each and every citizen in the Netherlands has an EPD, unless he/she formally refuses. The ambition of the EPD is to provide complete documentation on each patient instantaneously at any place of care, with explicit patient permission. This documentation, large repositories of medical, psychological and health knowledge, may be tailored to personal needs, giving advice, support or warn people in specific situations. Data-mining programs, software agents, and small bots can easily become medical friends, coaches and even therapists. These friends interact with the ‘data-identity’ of human beings. The data-identity acquires more and more agency over time. As the number of specific virtual environments for changing human behaviour is increasing fast and the development of larger healthcare systems progresses, the new interaction between human beings and systems demands rigorous analysis. Note that large databases also make it possible to create new kinds of interaction between the healthcare system, the insurance companies, employers and individual human beings.

This chapter focuses on how well-being of human beings in technology environments can be orchestrated. It argues that the design of witnessing is crucial and shows that in each of the four dimensions of the YUTPA framework (time, place, action, relation) specific issues for the design of witnessing in larger social technical systems can be identified. YUTPA is the acronym for ‘being with You in Unity of Time, Place and Action’.

Section 2 introduces an interdisciplinary social science and philosophical perspective on witnessing after which the YUTPA framework for design and analysis is shortly explained. Section 3, 4 and 5 present current exploratory research in which the YUTPA framework is used to better understand possibilities for witnessing in a variety of presence designs. Section 6 takes the results of the exploratory study and formulates possible implications for system design. The discussion in Section 7 relates insights and concepts to healthcare as a context for design.

2 Witnessing and the YUTPA Framework

The performance of presence and the enactment of being, presuppose the presence of other beings and as a result witnessed presence. Before language is uttered, human beings recognize spatiotemporal trajectories of other beings setting the parameters for any sequential interaction [1]. Witnessing can be distinguished from observing, in which cognition plays a significant role, and from perceiving, in which sensorial input has dominance. Witnessing, as proposed in this chapter, builds upon perception and observation but also includes the possibility to act upon what is witnessed. Being witness includes taking of responsibility by acting upon, or testifying about, the perception and observation of the situation to which a person is witness. Witnessed presence, operates on all levels of consciousness: it is one of the building blocks of social rules, defined by space and time. Social rules determine the social structures that human beings construct [2].

In Law, in communities, in businesses and organizations the persona of the witness is distinct. In most judicial systems the witness has to be sworn in. By doing so the witness accepts responsibility to speak the truth. In other words,

being witness involves accepting responsibility for what happens next. When being witnessed, any act becomes a deed [3]. Perception and observation involve judgement on several levels of consciousness. Witnessing refers to the fact that the persona of the witness embodies the possibility to act upon and/or to testify about the act. When witnessed, the perception or observation of an act is considered from the perspective of possible re-action and contextualizes perception and observation in the strive for well-being and survival in which the essence of presence is to be found [4]. Vice versa, when human beings feel there is no possibility to act (or re-act), people detach themselves from a situation and take a moral distance others, their actions and even to their own self [5].

In traditional social structures witnessing assumes a sharing of time and place, being in relation to each other, and having the possibility to act within the interaction that is taking place. In new space and time configurations facilitated by technology, such relations are not as easily acquired. Millions of people, however, use these technologies to sustain personal and professional relationships. A variety of presence designs have emerged and in all of these presence designs people find ways to communicate, to develop relationships between people in series of interactions. Having a conversation, making a phone call, sending an email, postings on the Internet and the variety of possibilities to chat or Skype are all specific presence designs, which contribute in a series of social interactions to the building up or breaking down of trust [3]. To have presence requires agency; to be able to perform presence; to be able to 'enact' being [6]. The way in which people are witness to each other, in the variety of presence designs, influences how trust is built [7].

Human kind has developed a variety of social structures in which witnessing is distinct: family structures, community structures, organizational structures, business structures, judicial structures, learning structures, national and transnational structures. In all of these structures people are witness to each other. This deeply influences how people interact. Conflict and tension are a given, but the way in which people handle conflict and tensions in one social structure differs from another. In a large comparative study Fukuyama finds that 'high trust' societies are beneficial for human beings: people are happier and live longer [8]. Business theory argues that high trust in organizations creates more success [9]. Stephenson describes trust as the sort of glue that holds social structures together [10]. In the establishment of trust, witnessing plays a significant role [7].

Oliver claims that the capability of witnessing - to witness, to bear witness and to be in dialogue with one's inner witness - is fundamental to being human [11]. She argues that being witness is characterized by the possibility of response-ability and address-ability. Response-ability refers to the subjectivity, which allows a person to respond to the person who testifies. Oliver connects this to ethical responsibility.¹ Address-ability refers to the being able to address one's testimony to another human being who will listen. Response-ability and address-ability function in relation with the 'inner witness' every human being has. Oliver argues that

¹ This resonates with Damasio's suggestion that in the strive for well-being and survival, also the ethical ground is to be found [5]. To hurt others makes one's own environment unsafe.

when being victimized or having to deal with trauma, people need to restore the dialogue with their inner witness. Only through the performance of testimony in which one can address a person who is willing to be witness and therefore is willing to respond and share responsibility for the performance of testimony, a person can transform traumatic experiences in such a way that repetition will stop. The joint responsibility of witnessing, as a source for the re-emerging truth, is needed to be able to give testimony of traumatic experiences of oppression and victimization, argues Oliver. The psychological process that happens as a result of giving testimony, in which the unsaid can be communicated, is transformation. Such transformation processes are part of all stages of life, of being mother and child, falling in love, developing friendships and more. However, 'false witnessing' has to be addressed in this context, Oliver concludes that if a person is not in the proper subject position witnessing cannot be. A subject position is defined by the social structures in which an individual acts and therefore has knowledge about. One has to be a farmer to give testimony about farming for example and not an actress. Subject position needs to be made transparent for witnessed presence to be significant. Oliver argues convincingly that through witnessing and being witnessed and through the dialogue of one's inner witness, the essence of human presence develops [11].

The presence design of Oliver's work on witnessing, assumes a sharing of time and place, being in relation to each other and having the possibility to act within the interaction that is taking place. Current technologies challenge this presence design by providing new possibilities to transcend time and place at a high speed and large scale. Presence, as such, has never been a given, argues IJsselsteijn, it is a trade-off [12]. At a certain moment in a certain place, given the specific context and perceived sensorial input, a certain status quo is accepted. The way sensorial input is understood is a trade-off. Eyes for example can only handle a limited amount of input in distance, colours and more. In day-to-day social presences human beings make trade-offs all the time. When a woman meets a big man in a dark alley at night there may be a moment that she decides to run without having to know exactly how strong the guy is or where he is from.

Also the way people adapt to new technologies is determined by making trade-offs [12]. When film was introduced more than a century ago, an audience would scream and shiver when a train would head their direction on screen. Through collective experience the understanding of the train on screen changed and 'screen-reality' has been accepted in its own right as part of day-to-day reality. These adaptation processes are time-based and are specific for certain periods in time in certain cultures and for certain generations as well [13]. Media technologies such as television, mobile phones, videogames, Internet and also the use of large databases and visualization of data-sets in professional environments for example, all cause new trade-offs to emerge.

The fact that presence is a trade-off, creates the possibility to design this trade-off. Not only time and place have a distinct influence how the trade-off is made, but also the relation between people and the possibility to act. The trade-off of presence determines how witnessing contributes to the ability to build or destroy trust [7]. The YUTPA framework has been developed to analyze trade-offs in

presence design [3]. YUTPA is the acronym for “being with You in Unity of Time, Place and Action”. In the YUTPA framework each specific presence design is analyzed along 4 dimensions: time, place, action, relation. Sharing time and place and being in a sustainable relationship with each other upon which one is allowed to act, is the ultimate YUTPA configuration in which trust increases or diminishes and in which ‘true witnessing’, in Oliver’s terms, may happen [11].

The 4 dimensions between Now and not-Now, Here and not-Here, You and not-You, Do and not-Do, influence the ability to build a sustainable relationship as defined by trust. Not sharing place, not sharing time, not being in relation and not having any possibility to act creates zero dynamics for building or breaking down trust. When not sharing time and place with someone with whom one is deeply related, trust travels easily and technology mediates this trust. When making a YUTPA analysis, a rigorous describing of each of the four dimensions in relation to the other three sheds light on how the trade-off in a specific presence design is made.



Fig. 1. The YUTPA framework defines in four dimensions the relation between presence and a sustainable relationship defined by trust. The black and white parts of the sphere present the possibility to act (Do/notDo).

3 Exploring Witnessed Presence and Systems Engineering

To explore the different ways in which witnessing has emerged in new forms of interaction between man and machine Nevejan and Brazier (authors of this chapter) designed the qualitative study that is presented in this section. Initial results will be shared in section 4 and 5. To explore Witnessed Presence artists, designers, engineers and business developers, whose day-to-day practice is deeply affected by technology have been interviewed by Nevejan. The choice of experts is not arbitrary. They have been chosen on the basis of their reputation, knowledge and experience. The intention of the interviews is to make their tacit knowledge on witnessed presence surface, to discover words and concepts related to witnessed presence and its four dimensions. The first results of this study provide a rational and ethical basis upon which applications and infrastructures for healthcare can be analyzed and designed.

3.1 Methodology

To explore 'witnessed presence' 17 interviews have been conducted with designers, social scientists, engineers, artists and business developers in the Netherlands and in India. The people interviewed are fluent in more than one professional language and have a rich experience on which their knowledge, insights and skills are based. All of the experts have an established reputation in their field. The interviews can be considered as acts of Parrèsia², the ancient Greek concept for knowledge that evolves from personal and professional experience in respected contexts [14].

² The Greeks made a distinction between Epistème and Parrèsia. Epistème refers to knowledge production in which objective knowledge is produced by logical reasoning and by providing evidence. Modern science is largely based on this tradition. Parrèsia refers to the act of speaking the truth from a specific personal experience and a recognized ethical position. Parrèsia is not easily accepted as a method for producing knowledge in the scientific realm. Yet in contrast to this, in the professional realm a personal speaking of the truth that derives its authority from experience and a recognized ethical position is widely accepted and appreciated. According to the Greeks, to be able to speak the truth a person needs to have the right attitude. "In Parrèsia, the speaker uses his freedom and chooses frankness instead of persuasion, truth instead of falsehood or silence, the risk of death instead of life and security, criticism instead of flattery, and moral duty instead of self-interest and moral apathy" [14]. The process of revealing truth to oneself involves formulating, taking distance, evaluating, analyzing and re-formulating. Foucault was inspired on Parrèsia as a methodology for analysis by Plutarch: "These exercises are part of what we could call an "aesthetics of the self". For one does not have to take up a position or role towards oneself as that of a judge pronouncing a verdict. One can comport oneself towards oneself in the role of a technician, of a craftsman, of an artist, who — from time to time — stops working, examines what he is doing, reminds himself of the rules of his art, and compares these rules with what he has achieved thus far." [14].

The interviews have a very open character taking the experience and expertise of the experts as perspective. The interviews can be best characterized as structured conversations in which current thinking is shared and explored in the different discourses and disciplines in which the interviewed people work. The interviewer's role can be characterized as being witness to a performance of testimony on the interviewed person's professional experience and reflection on this experience; offering address-ability and taking response-ability in a context in which subject positions are clear. The interviewer knew the subjects professionally. In all of the interviews the notion of witnessed presence and the four dimensions of the YUTPA framework are addressed in relation to the practice and insights of the expert interviewed.

Fundamental in this study is its interdisciplinary nature. The specific understanding of a phenomenon and the words that describe a phenomenon in relation to other concepts and phenomena in a specific discipline, are diverse and cannot be easily transposed to other disciplines. The understanding of interdisciplinary research in this study builds upon the awareness that such research requires multi-lingual skills as well as an open attitude [15]. Specific requirements have been met to facilitate the interdisciplinary nature of this study. In the first place the research question offers a perspective to which the different disciplines can relate. Secondly the research context provides a climate of experience with interdisciplinary research in which a manner of conversation has been developed in which terms and concepts are under constant exploration. Thirdly, both investigators have acquired multi lingual capacity in many interdisciplinary projects before. Last, but not least, all of the people interviewed have shown to be willing to endure the uncomfortability that is part of exploring new territories. This interdisciplinary exploratory research project is not a comparative study. Through the accumulation of insights from different domains and practices, a sketch of witnessing in technology environments is made.

In the interviews the perspective of the actor in an agent-actor environment is central. This is also the focus in the presentation of the results. The research informs experiments in the field of collaborative distributed work, the modelling of systems for crisis management and inspires further thinking on the ethics and implications of system foundations.

To offer maximum transparency and increase the validity of this study all interviews have been filmed and the source material has been published on the Internet. Each interview lasts one hour, filmed in the presence of a camera and a cameraman.

The interviews have been filmed with a wide angle to provide an impression of the way people move and gesticulate while being deeply involved in expressing their views. The complete transcript of the individual interviews including film fragments can be accessed at <http://www.systemsdesign.tbm.tudelft.nl/witness>. Note that in this chapter references refer to the opinions expressed in the interviews themselves, often introducing the expert briefly.

4 Results: Exploring the Context of Witnessed Presence and Systems Engineering

The nature of the interaction between human beings and systems influences the way presence is witnessed. This section first focuses (1) on interaction with technology, (2) on how biological, social and algorithmic realities merge and (3) on how partial perspectives change through transaction.

4.1 Interacting with Technology

For many centuries being witness referred to an ‘inscribing with the body’ one’s presence and therefore being able to testify, as formulated by new media artist Hazra [16]. Physically presence was needed to be witness to a situation. Today’s technologies, with their different scale and speed of collecting and distributing data, offer a perspective that human kind has not been able to perceive before. People can be witness to situations thousands of miles away. Both on the micro level as happens for example in molecular science as well as on the macro level with technologies like satellite, database technologies and the Internet, human beings can perceive realities they could not perceive before. As users of technology human beings become actors in these environments. Both technology and human beings are in a process of change because they interact.

In traditional communities of artisans witnessed presence is fundamental, argues designer Panghaal [17]. In addition to working with companies such as Nokia and Motorola, Panghaal also works with communities of craftspeople who for example work with steel in the same way as people would do 2000 years ago. Artisans do not make things in the past or project their work in the future but create now and here, Panghaal explains. It is physical work and if the body is not centred the artisan will not be capable to do the work the next day. The interaction between body and material is profound. The material actually changes the human being who works with it. Like material, also the interaction between technology and human being affects people profoundly. Panghaal cites the example of the mobile phone, which has a side effect of not having to make decisions anymore about being at a certain place at a certain time to be able to meet [17].

The interviews support the assumption that technology has impact on the four dimensions of the YUTPA framework by changing e.g. scale, speed, perspective, granularity, and rhythm. Technology, however, also communicates concepts of ethics and aesthetics at the same time. Van Splunter, computer scientist, makes a convincing argument that when making a chair a concept of sitting is communicated, when making an email program a concept of communication is created and so on [18]. In architecture, where technology has a great impact on the tools and materials that can be used, algorithmic reality offers a new sense of aesthetics for which people can be sensitive. A new visual logic is emerging, according to architect Jansma, even though visual logic cannot be expressed in language as such [19]. Technology affects human perception and action and while doing so it communicates concepts of ethics and aesthetics at the same time as well.

4.2 Biological, Social and Algorithmic Realities Merge

Infrastructures and people adapt and this is part of the evolutionary process of social technical systems in which people live, argues anthropologist and designer Sood [20]. However, argues Sood, people know what they deal with. Even when dealing with complex technological systems or robots or agents, human beings will recognize in a limited amount of time whether they deal with something human or technological.

Today's technology, however, offers limited sensorial experiences of quality by itself and therefore it mostly depends on references of profound experiences in other realms of life argues Panghaal [17]. Interfaces are designed to give a sense of gravity or force feedback, specific personalization is made possible and lower layers of technology are hidden. Differences between biological, social and technological input are often purposefully blurred to provide a frame of reference, to support acceptance, making it difficult for users to distinguish the roles, argue computer scientists Warnier [21] and Quillinan [22].

Not only biological and social reality define people's sense of the world around the globe, also technological reality has deeply invaded human beings perception of self, illustrates Hazra [16]. Medical technology and information and communication technology merge with social and biological perception into one image of the human body and its environment in common practices of all sorts. Taking the example of sleep, Hazra explains that a person has the sense of sleep, he or she may use a monitor to be aware of personal patterns of sleep and there are statistics on patterns of sleep. In the experience of paying attention to sleep all of these kinds of information about the self merge into one feeling and knowledge base about sleep. Because different realities merge, a variety of presences may exist and technology is capable of offering new perspectives on the self from a 'third point' as Hazra calls it [16].

4.3 Partial Personal Perspective Changes through Transaction

In the merging realities it is important to realize that each individual person makes his or her own specific configuration of different realities according to personal need. When sleep is not an issue, only the biological reality may be a reference for a person. Only when sleep becomes problematic do other realities merge. In health situations personal reality configurations are distinct between different people. The merging of biological and social reality, as in the nature-nurture debate, already creates lots of fundamental confusion. The variety of presences technology facilitates, and the large information and communication repositories it produces, makes the confusion even more profound. The fact that realities merge does not imply that human beings perceive more of what happens or perceive in a more profound way. Merging realities influence individuals' mental maps and understanding of the personal body and of the contexts in which people find themselves. But also in larger merging realities human beings have partial perspectives. Presence is a universal concept and witnessing is not, according to communications scholar Parthasarathi [23].

Bawa, scholar on politics of land, finds that even the way people understand ‘the land’ has become a complex issue in which different realities merge. Ownership, political and social relations, business, maps, television and databases define how people perceive their urban environment. Real and virtual flows merge but she finds that in the merging realities, the social-political position of human beings remains to be distinct when being witness to what happens [24]. In her work on religious contexts, on housing politics and in the warzone of Srinagar, she finds that without being in dialogue there is no interaction and the being witness to each other becomes a mere judging [24]. Parthasarathi argues from a different realm that the social-political position of people defines what they can be witness to even when different realities have merged. If one is not in dialogue or in transaction with a specific situation, one cannot be witness to that situation [23].³ From yet another perspective Wilson, technical director of an online software company, supports this argument as well [25]. For her, the different realities of the online and offline world merge in her personal life, but do not merge at all in her social life. Because most of her friends do not know her online life, she cannot share this world and they cannot be witness to a large part of her life. There is no language in which she can express this other world to people who are not part of it [25].

A partial perspective can only be changed by transaction, argues Parthasarathi [23]. Only when being in transaction can one be witness to each other and perceive new parts of the merging realities through these transactions. Social political positions, in the merging biological, social and algorithmic realities, define with whom and with what one can be in transaction with. In healthcare other perspectives are mostly created when being confronted with implications of illness or pathological patterns of behaviour. Also here, the need to develop other partial perspectives only evolves when having to enter into new transactions in order to safeguard well-being and life. Hazra argues that the realization of merging realities demands for a new ethics of responsibility, which is no longer based in presence alone [16]. Especially for healthcare such an ethic has to be explored.

5 Results: Exploring Witnessing in the Four Dimensions of the YUTPA Framework in Relation to Future Healthcare Issues

Time, place, relation and the possibility to act define the subject position of a human being in the social structures he or she is engaged with. When discussing the construction of time, place, action and relation between human beings and systems it is necessary to make a distinction between two kinds of interaction. There are interactions in which a human being directly interacts with the system and there are interactions in which technology mediates human interaction. In healthcare both interactions take place separately and intertwined in certain cases. This

³ In an analysis of the media-coverage of the Mumbai attacks, he argues that because the reporters were all familiar with the hotels that were bombed, the media coverage focused on these hotels. The railway station, where many more people died, was hardly mentioned because the reporters, nor the owners of the television stations, were regular users of the railway station. To them the railway station had no significance.

distinction is made in the following four sections on the dimensions: time, place, action and relation.

5.1 Time Is the Beholder of Trust in Online Collaboration

When designing processes, systems and applications, time is one of the features to be constructed: rhythm, instances of synchronization or random noise. Design of time is one of the four dimensions that is distinct in the experience of the users of a system.

Human beings and systems have very different structures in time. Human beings breathe, have heartbeats, get tired. They need to sleep, drink and eat. Human beings live only for a limited amount of time and go through life cycles. A human being's memory is distinct, specific events are remembered and others are not, whole chunks of time, disappear from conscious memory. Different senses have different capacity for monitoring time and triggering memory. Human perception of time is determined by feelings, emotions and sensations. Computers time is very different. Computer time has well defined intervals of equal length. System behaviour can be endlessly recorded in relation to time without distinction between one instance and another. The recording itself may deteriorate, but if replicated it may remain available on the Internet forever. Generation after generation of data storage technology has improved significantly and by now memory seems to be infinite. Humans operate on a completely different rhythm to computers. This makes it more difficult for humans and computers to relate find computer scientists Quillinan [22] and van Splunter [18].

However, when technology mediates human collaboration 'timing' is critical in online processes. One of the assumptions of this study is that in online collaboration new kinds of witnessing, in which sharing of time and place is no longer necessary, are evolving. Where before 'place' seemed to be the beholder of trust, in online collaboration 'time' is the beholder of trust, concludes social entrepreneur and Free Software advocate Abraham. In several interviews this conclusion was supported. But where in small companies it is a genuine challenge to find the rhythm that is good for all, especially in the large scale distributed work in the outsourcing industry time is the ultimate tool for control. Anthropologists Upadhyaya [27] and Ilavarasan [28], who both did extensive studies in the outsourcing industry in India, come to this conclusion [30][31].

In small companies rhythm in the orchestrating of workflow is crucial, argues Wilson [25]. Weekly online meetings with business partners, feedback to software patches within a day, response time to clients in a limited amount of hours has to be established like rule. For every task a specific medium is used: email, chat, Skype or phone. With different collaborators different rhythms are established. Wilson argues that because of these rhythms people manage to collaborate for over 4 years now while living in three different continents. Part of the rhythm is that, especially with the business partners when new plans are made or trouble is serious, people meet in real life. Smaller problems are usually solved in company hierarchies. Most important is keeping a good rapport, spending some time on jokes and keep writing the courtesy lines. Spending time on these 'useless' things makes a significant difference in the smoothness with which collaborations,

according to Wilson, evolve. In this case organizing time in an efficient way benefits the workers greatly. The fact that they all keep to the rhythm is an expression of respect [25].

Very different is the time management in the outsourcing industry in India. In the last decade the Indian outsourcing industry developed the Global Service Delivery model within its IT industry in which Indian companies provide services 24-7 worldwide. Fundamental to the Global Service Delivery model is that local Indian workers adapt to the timezones of clients abroad. Shifts around the clock one can find in a variety of professions, but the outsourcing industry organizes its time more profound. Every single day, nearly every minute of every person all sorts of technological systems monitor their work. This 'low trust' environment affects the people who work in it and triggers an unintended dynamic of low performance as result, noticed Upadhya [27]. The lack of control, the boring work and especially the organization of the business and its systems, which register people and their deeds in a highly technological industrial manner, create contradictions and conflicts. There is no concept of 'personal' time for professionals involved. People work 10- 14 hours a day and are being monitored constantly. Many professionals start to miss the human touch in their activities. As a result, psychological stress related diseases have become a factor in India's healthcare as never been before, argues Ilavarasan [28].

Implications for Healthcare

Genuine witnessing is embedded in Wilson's company. People know each other, have met in real life and sustain their relationships over time by using technology. Time is core to their online collaboration: by keeping the rhythm, by creating consciously patterns of presence and absence. Time is the beholder of trust. When transposing this experience to cyber therapy for example, it is clear that sustaining relationships in real life is necessary for witnessing online to be genuine and effective in its intention. If not, processes of projection and attribution will trigger false witnessing in Oliver's terms. However, in specific cases anonymity may be beneficial especially when moral conviction is at stake [3]. Further research needs to focus on whether and how a clear rhythm in online collaboration between client and therapist can structure these processes of attribution and projection, which are part of any therapeutic process, in a beneficial way. Patterns of presence and absence seem to be a requirement for genuine witnessing to emerge.

When transposing the experience of the outsourcing industry in India to future healthcare systems which are more and more directed towards constant collecting and distribution of data of clients and their health, it is clear that 'monitoring' in it self is not beneficial for the human beings involved. It may generate lots of data that have the potential to lead to thorough advice and scientific results. However, a low trust approach creates low performance with ultimately stress and depression as a result. 'Monitoring' is apparently very different from witnessing in Oliver's terms. The question is whether it is the monitoring, or the log-files or how the log-files are used, is to be held responsible. It is clear that when people sense or know that they are being monitored while not being in control, this is

detrimental for well-being. In the outsourcing industry hierarchy and production values undermine people's response-ability and address-ability. In addition, no privacy is granted because every minute is recorded and every exchange is kept. In such a context witnessing becomes an exception.

5.2 Place: Global Roots in Locality, Emotional Space and Visual Logic

Where architecture and thinking about architecture has a tradition of millennia, only in the last few years has research focused on the sense of place in virtual environments. For many centuries the physical environment defined people's distinct sense of place. The sense of place was deeply intertwined with the social structures. Place is still a strong beholder of trust. Simple conversations on the mobile phone regularly start with the question "Where are you?" Three aspects of the sense of place in the merging realities relevant to the design of future health systems surfaced in the interviews: (1) working global, living local, (2) impact of emotions, and (3) the sense of space.

The first issue concerns the 'working global, yet living local' effect of place. In the global business environment people remain rooted in their local environment. In the IT industry people talk about 'becoming global', referring to a meaning of the word 'global' that somehow includes moulding behaviour into a model, which everyone can understand regardless of where they are from. But in spite of 'getting global', Upadhyia finds that it really matters where a person comes from [27]. In international projects people attribute many of the problems to communication gaps or cross-cultural differences. Instead of seeing themselves as working in a common culture, the digital culture or global technology culture, people see themselves as being located in these very distinct traditional cultures. To Upadhyia this shows that people, even when they are working in cyberspace most of the time, are, in fact, rooted in their localities [27].

The second issue that surfaces when addressing place in relation to health, is the fact that emotions have a great impact on the experience of place. Social relations, architecture and the environment shape an individual when growing up, indicates Bawa [24]. When people are involved in conflict, and feelings of discomfort, anger and resentment determine how one is capable of relating to others, all sense of space disappears. Even a large house can offer no space in such a case. Conflicts influence experience of place. The Internet influences the sense of place as well. In Srinadar, in Kashmir, for example, the state shut down the Internet during war and this aggravated people intensely, Bawa found. Where the state treats Internet as a medium, for citizens it is actually a utility. It is above all a space, a window to the world that one really needs in times of hardship. By shutting down the Internet the government shut the citizens off from the rest of the world. The relation between place (land and space) and the online world, between the real and the virtual, is not dichotomous. It all flows into each other and emotions have a significant influence in this, argues Bawa [24].

Thirdly the 'sense' of place is of importance. The sense of place is very strong because it is fundamentally defined by how one interacts with a space, explains

architect Jansma [19]. By participating in a physical space, touching it, engaging with it, the perception and vision of the built world changes. When designing physical environments the human body is always key to the design: vision, hearing, physical constraints of human size. The experience of one's body is crucial for the sense of place. Rhythm, timing, breathing, looking, smelling, temperature, tactility and moving with the body through the space are all elements that influence the sense of place. Having identity in a space and knowing where you are, makes people more relaxed. For Jansma the question whether space has acquired a new communicative capacity because of technology that makes it possible to send each other 'some space', where before we could only send some language or things, is irrelevant. Space has always been communication from the designer of the space to the user, on a non-language level. It is a very authentic communication channel, which doesn't have another truth behind it. A person, who witnesses the pattern in a building or an online environment, will not see the logic behind it but will experience the logic. How people relate to/sense such visual logic is highly personal. New technology is making it possible to create form or space and give it enough complexity to make it interesting. It has a logic and quality of its own, according to Jansma [19].

Implications for Health Care

For future healthcare environments the design of place, and the notion of knowing where one is, is crucial to having identity and feeling secure. Local physical environments influence the online sense of place, just as local physical environments are influenced by the online world to which one has access. Emotions change the sense of place and place triggers emotions as well. The design of place is more complex than a mere offering of functionality. It communicates a visual logic of values and complexities to which human beings are sensitive.

5.3 Relation: Communion, Use, Engagement, Performance and Global Communication Skills

Human beings are in relation with each other and with their environment through the dynamics in relation, performance and global communication skills. From the perspective of the actor, three dynamics in relation have been mentioned in the interviews with respect to orchestrating communication processes in merging realities. Sood, having worked extensively with Nokia for example, makes the following distinction [20]. In interactions with human beings and other natural and intelligent life forms the first of the dynamics in relation is communion. Communion offers the possibility of a shared meaning. Secondly human beings can be a user of things or an environment. A user is aware of the instrumentality of his or her actions with objects and systems with which he or she interacts. Thirdly, pointed out by Hazra, a human being can be engaged with an environment. Engagement refers to a granularity of involvement, to the intensity of sustained interaction [16].

Dynamics of relations have different characteristics in the variety of social structures human kind has developed. For many centuries people have lived in centred communities. Centeredness evolves from an awareness of physical being and behaviour. In centred communities people share place and practice and have immediate feedback on their work and witnessed presence in the community. Centeredness is a quality that makes human beings viable and gives them the wits to survive, as designer Panghaal formulates [17]. In centred communities people are in communion with each other and their environment. Awareness of the instrumentality, of one's actions within the community is part of the shared meaning that evolves from being in communion, as is engagement.

In merging realities in urban environments *engagement* is the primary means with which relations are defined. Through engagement a shared meaning with others may evolve. Being a user is also part of being engaged. In merging realities engagement becomes the source for authenticity. One can be as authentic on Facebook as if one has lived on the same piece of land for over 80 years, argues Hazra [16].

Levels of trust define rules of engagement. Establishing trust in a technology environment is not easy, finds Kaul [29]. Kaul trains professionals who work in the outsourcing industry and she finds that establishing trust requires the development of specific competences. Integrity, sharing (confidential) information in an honest fashion is a first requirement for establishing trust. Secondly it is important to show capability; to be on time, to deliver work on time, to be consistent. Thirdly it is important to be clear about intentions. Building reputation is a fourth requirement; one has to realize that trust travels between people; the relationship one builds with one person will generate trust when one learns to know a connected third person [29].

Several of the experts interviewed comment on the issue of manifesting identity in relation to being engaged in the online world. Especially in professional environments manifesting identity requires strategic attention. In small companies people stage identities towards clients, as it is good for business, but between colleagues a shared meaning is constantly negotiated because people trust each other and are dependent upon each other as well, finds Wilson [25].

In the open source community one of the drivers for contributing to the larger libraries of work is the fact that one earns reputation by performing convincingly. *Performance* is very much tied into the concept of showing capacity, but also reflects on a person's identity in the open source community, states Abraham [26]. Trust is organized in very transparent ways in these open source communities and the 'benevolent dictator' who runs such communities can be held responsible in the end, as Abraham formulates it [26]. The transparency of published and documented work is characteristic for the open source dynamic and facilitates people to perform.

In large production environments, as in the outsourcing industry, a specific kind of personal performance is staged because people have to mould into the Global Service Delivery model, concludes Upadhya in her extensive study on the IT industry in India [30]. Workers are witnessed and stage an identity to be witnessed with, yet the space in which they can take responsibility and be witness is

very limited. This leads to a staging of professional identity that reflects an image, inspired by Silicon Valley models of how a software engineer should be. The staged identity deeply invades the self-reflection of people involved and as a result there is a great discrepancy between the actual practice and the self-image of the software engineers involved [27].

When manifesting identity and performing witnessed presence the relation with the self is at stake. Where before people could have different identities in different environments, in the merging realities the bandwidth for identity has diminished dramatically. Because of distributed networks and the infinite storage of data, the performance of different identities will inevitably clash. Spending lots of time online in a variety of networks for several years now, Abraham notices that as a result people end up deploying the lowest common denominator of their identity in environments where on- and offline worlds merge [26].

To be able to work in a global context people have to learn and adapt to cross cultural communication and learn ‘*global communication skills*’, argues Kaul [29]. These skills mostly focus on behavioural skills: to show that one understands, (instead of just understanding it in ones own mind), to show confidence, to learn to present professionally, to be aware of body language, to develop verbal skills, to manage expectations, to make clear what one needs, what one expects and what one wants to do with ones team and with the global teams [29].

Global communication skills are designed to help people communicate across cultures, to help people to witness and be witnessed themselves. However, in the low trust environment of the outsourcing industry these behavioural skills do not seem to prevent the rupture between performance and inner witness. Narayanan, director of Sristhi School of Art, Design and Technoogy, having witnessed the development of Bangalore since the 1950’s, strongly states that ultimately in the end humanness, being witness to each other and connecting with one’s inner witness, is a personal choice to trust [32]. One has to stand by this choice to trust and accept the consequences. Failing is crucial when one wants to learn and make things. Guiding people through processes of failing, finding ways to deal with it and energizing people’s motivation again, is what true leadership in collaboration is about according to Narayanan [32].

Implications for Health Care

For the design of future health environments notions of engagement and performance are distinct. Through being engaged shared meaning and new use evolve. Engagement is triggered by desire, motivation, fascination, perseverance, necessity and more. Granularity and intensity of involvement have to be addressed. Secondly the notion of performance requires attention. How much performance is beneficial for human beings and how do people detach their ‘inner witness’ from their potential to be witness and be witnessed? It is clear that trust in the variety of social structures has a significant impact on how people relate and can or cannot be witness to each other. In merging realities trust benefits from a clear understanding of subject positions, from a matching of online with offline

experiences, from acquiring global communication skills. Finding the wits to survive and having the courage to trust and possibly fail, is in the end a personal choice.

5.4 Action: Inscribing Physical Presence, Online Transactions and Performance Online

The experts interviewed referred to action with respect to inscribing physical presence, online transaction and performance online. To better understand ‘acting’ in merging realities in relation to *physical presence*, first the situation in the Dutch Courts of Law is discussed. Proof of actions is part of finding the truth in Law. In actions, as well as traces of these actions, technology plays a significant role.

In Law the witness is a distinguished persona and in the merging realities the court is faced with new questions and dilemmas, explains judge and professor of constitutional law Van derVlies [33]. In Law a witness has to be sworn in and by this act words become deeds as well. Lying, when under oath, is considered to be a crime. Especially in Court where witnesses often have intense emotions about the crimes discussed, the judge has to disentangle emotions and facts. To this purpose, judges first make a common ground in the emotional realm. Sadness and anger have to first be recognized and accepted before the unfolding of facts can be addressed, as Van derVlies finds in her practice as judge [33]. For the Law technology creates a ‘void’ and therefore technological evidence cannot be accepted on face value: an expert opinion on the validity of the artefacts is needed for the judge to be able to understand their value in the process of establishing facts in the process of law. A trusted expert needs to report on the validity of evidence. Also witnesses have to be physically present in Court, either in the Court of Law at which the Judge resides, or (currently in experimental phase) using videoconferencing technology, in another Court of Law in which a Trusted Third Party (TTP), eg another judge, witnesses the testimony of the witness. The oath is taken in front of the TTP. So far, being witness in processes of Law involves being physically present in front of the Law [33].

In the online world an individual only exists because of *transactions online*, argues Abraham [26]. There are two types of transactions. There are machine records of transactions and there are mediated witnessed interactions (editing of pages, public postings, making links, ‘I show I know you’). Digital witnessing contributes to the establishment of reputation and authenticity, through hyperlinks and records of transactions between humans and machines as well as between humans mediated through machines. One has to do transactions all the time to prove existence in time and space, finds Abraham [26]. As indicated in a number of previous sections, in the outsourcing industry recording of transactions is taken to the extreme. But also in a small company log showing that transactions have taken place proves physical presence at work. Log-files as well as the response time to each other’s transactions online, are crucial indicators for people’s presence and trustworthiness online [25] [27] [29]. Such transactions are part of production processes and are not geared towards a fundamental process as finding the truth and taking ethical responsibility in this process. Especially in the open source communities the transparency of transactions and the documentation of previous

transactions while sharing work, creates a great sense of value, personal reputation and trustworthiness [25] [26] [27]. Apparently the dynamic of ‘sharing’ transactions is different to the one of ‘controlling’ transactions.

Testimony and presence in on- and offline environments is highly dependent on *performance*. Change in performance is another element that has been addressed in the interviews. Parthasarathi has studied the Indian music industry and has discovered the following phenomena [23]. In live performance of music the interaction between the singer and the listener is vital. The way the listener responds to what is being sung changes how the singer performs. In recorded versions of the same music the voice that could only be heard before at a special occasion is set free from the boundaries of time and place. As a result, the relation between the performer and the listener has changed profoundly: the context, the nature of the performance, the relation between the voice and the ear, the relationship between where the voice is coming from and where the voice is heard. The experience of listening to music has become anonymous for both the listener and the singer. If the singer does not know for whom he/she is singing then a more standardized composition will be the result, concludes Parthasarathi [23]. This resonates with the idea that in online environments people lose bandwidth for the performance of identity. Because relations are more anonymous, the nature of action is changed.

The primary quality of transaction between the real singer and the real listener is the physical relation of presence between them. The moment it is mediated there is not this real transaction but nevertheless people experience the mediated presence in the recorded music. In the mediated experience the cognitive understanding of what one is listening to, as well as the context in which one experiences the replayed music, mostly influence the experience, argues Parthasarathi [23]. Different media today create different kinds of presences dependent on how they facilitate different kinds of transaction in time and place. The telephone for example offers synchronous dialogues and therefore it is not replay, it is ‘live’ transaction. Because people use technology devices, they also adapt to them. When focusing on adaptation the question arises how far the design of technology can stretch the human capability to adapt. It is clear that there are physical thresholds of weight, size, sound level, clarity of the screens and so on. When focusing on social or psychological effects of media-use one may ask very different questions, according to Parthasarathi, like for example what happens to the understanding of the national news when one watches it alone, with a group or with three generations present [23].

Implications for Healthcare

For future healthcare applications these questions are very relevant. Physical presence is distinct yet human beings adapt to mediated presence, find ways to establish authenticity and reputation online and find ways to perform presence in online environments. However, the effect of these solutions reaches further than is visible at first sight because apparent ‘handy’ solutions deeply influence how people establish trust and find truth. Synchronous mediated communication and just in time exchanges of transactions seem to be crucial for establishing trust. Time in this sense, as stated before in section 3.3.1 is the beholder of trust. For future

health applications in which online communication is vital, orchestrating a time design in transactions is distinct. The nature of transactions online in the interaction between the witness and the one who witnesses online, is determined by the limited possibility to perform one's presence. The context in which the mediated communication is perceived has great impact on how the communication is experienced.

5.5 Discussion of the Results of Exploring Witnessing in the Four Dimensions of the YUTPA Framework in Relation to Future Healthcare Issues

As computers are capable of many different types of interaction they have been attributed with many different qualities. In 1966 Weizenbaum's program Eliza showed that the endless patience of a computer posing repetitive questions modelled after Rogers conversational style of psychotherapy, convinced people to freely express their experiences and true feelings. The fact that the computer is there and like the stuffed animal or the doll does not get impatient and therefore freely allows for processes of projection and attribution, is part of the success of this program. Today when surfing anonymously on the Internet, and using that hole in time that is available 24/7, these processes of attribution and projection are at least as strong. In some cases these processes are effective, contributing positively to the health of people in, for example, anonymous help with abortion [34]. Digital interventions through low threshold self help programmes are proofed to be significantly successful in curbing drinking problems [35]. In other cases, as is the case with anorexia sites for instance, the processes of attribution and projection seem to confirm pathological behaviour and are destructive for many young women involved [3].

The question these developments pose is how much 'realness' people need to be able to be responsible for their own well-being and survival. When designing future health environments 'realness' can be the result of any one of the 4 dimensions of the YUTPA framework. Time design can offer synchronicity and just in time transactions. Place design has to respect the locality of the people involved. It may resonate or even trigger emotions and by its design will influence how people feel. Relations have to be established in the merging realities. Through being engaged in different kinds of presence, in physical presence and in the different media that are available, shared meaning may evolve. In the establishment of relations the confusion between systems and human mediated communication, between communion and use, may be profound. Over time people will realize the differences between types of systems and especially in crisis situations people will know in which systems or people to place their trust. Action in online environments is largely dependent on transactions. Through series of transactions the sense of interaction emerges. As in real life controlling transactions offers a very different dynamic than sharing transactions. Sharing work through transaction is beneficial for many people involved. The performance of presence in online environments does not support a rich enactment of identity and is dependent on the orchestration of series of transactions. For certain health environments anonymity and no physical presence is beneficial, yet synchronicity of transaction is vital.

Others need physical presence only once in while and will benefit for asynchronous transaction in between.

Future health environments need to take into account that:

- (1) time is orchestrated to be the beholder of trust
- (2) on- and offline place are designed to support emotional well-being with respect of the locality of the people involved
- (3) the relationship between people has been established in an offline context, will enable health applications that support response- ability, address-ability, transparency of subject positions and the performance of testimony, contributing to the humanness of people involved. Mutual witnessing is the result. In specific cases anonymity may be beneficial for people involved. Further research has to show how witnessing in such cases can or cannot be orchestrated.
- (4) Series of transactions online create a sense of interaction in which patterns of (physical) presence and absence are distinct.

6 Witnessed Presence and Systems Design

In merging realities systems transparency is leading in design. Users need to understand the roles they play in interaction with a system, and the responsibilities associated with these roles. The same holds for the systems with which users interact: their roles must be transparent as must be their responsibilities. Systems have the responsibility to manage interaction with users, their own processes, user data and system data responsibly. The subject position of both the user and the systems must be transparent. In this chapter the YUPTA framework has been used to analyse the elements that determine subject position.

With respect to Time this chapter argues that synchronisation of rhythm is core to trust. Systems and users need to synchronize their rhythms when presence in interaction is of importance. Systems and users also need to be designed to support different patterns of presence and absence in their own roles and in their interaction.

With respect to Place this chapter emphasizes the importance of experiencing place-ness and supporting well-being of human beings in system design. Visualisation plays an important role in this respect. Transparency of place-ness and well-being of data (ie location and integrity) is also a requirement for system design.

With respect to Action this chapter stresses the need for transparency in action and interaction: transparency of conduct between agents and human beings, transparency in the tasks and roles and responsibilities in their interaction, is essential to trust and integrity.

With respect to Relation this chapter identifies the need for transparency in the relations between the roles humans and systems play. The distinctions between human/human, human/system/, system/system, but also transparency with respect to their interaction with their environment, needs to be made explicit.

Transparency, integrity, identifiability/traceability, privacy, autonomy, and trust are key concepts identified by Brazier, Oskamp, Prins, Schellekens and Wijngaards for the design of actor-agent systems (systems in which autonomous software systems interact with human actors) from the perspective of legal acceptance [36] [37]. These concepts are very closely aligned to the concepts developed within the here presented study.

Designing systems to support the types of requirements identified above involves multiple challenges. Hardware, operating systems, middleware platforms and applications, and their interaction in different environments, together determine if and to which extent the above requirements can be fulfilled. Each computer system, for example, has its own rhythm, its own clock. The operating system translates information provided by the hardware to a concept of time. This notion of time is used by middleware platforms and applications to synchronise interaction with human users and other computer systems. The time experienced by a user in interaction (within a virtual environment for example), although abstracted from the underlying computer systems, is often not identical. Applications define how interaction with the human user, with other automated systems and with the environment is structured in the context of a social structure, relying on the functionality provided by the hardware, operating system, and middleware. Applications define how time is experienced. If, however, the underlying levels in system architecture fail, so will the time experienced. In the synchronisation of the clocks, participation and interaction between human beings and systems acquire meaning. Ultimately the applications define the rhythm in interaction, define absence and presence, in the experience of the user.

New types of systems in which multiple realities are involved, requires iterative processes of design to make such systems beneficial to human well-being. To this goal, 'realness' is a factor of distinction but only evolves in series of transaction and interactions between different systems. Orchestrating trajectories, using trade-off, making up for loss of YUTPA at certain moments by creating synchronicity of time or place or shared action in between, requires interaction with the clock.

Social structures define a human beings subject position. Many systems mirror existing social structures and the division of power within these structures. The Internet, however, has created the ability to create new social structures, creating new roles for human users. The creation of autonomous computer systems (both hardware and software) is creating new forms of agency both for technological agents and for human beings as well. New insights and skills are required for human beings to deploy these systems, taking responsibility for their own well being in the biological, social and technological realities as they merge.

7 Future Research

Soldiers can be taught to work together, to learn social skills and effective collaboration in specific situations in VR environments and many more [38]. But can a soldier who returns from war go to a VR environment and learn to deal with his trauma? Can the machine listen to his pain? Can a person who is not there but

definitely listens by phone for example, help him out? Literally out of his trauma by offering to be witness and sharing responsibility for his testimony? Can we share responsibility in online environments? Situations and trauma that a war veteran faces, reach beyond individual destiny but demand political and social commitment as well [39]. Frantz Fanon already argued, that every individual change needs a social context to behold this change [40]. Can a networked systems environment offer such a social context?

How virtual environments and physical environments collaborate for the well-being of people involved is a new domain of research [41]. The here presented work shows that such research should have the ambition to move beyond cognitive behavioural therapy, in which virtual environments are used more and more already today. Health and well-being are more complex. Further research into witnessing will focus on how response-ability and address-ability and the locality of subject position can be shaped, when not sharing place. Time design will be in the focus of attention in this work.

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Appendix

Interviews can be found at <http://www.systemsdesign.tbm.tudelft.nl/witness>. For convenience short descriptions of the interviewed persons are given below.

Sunil Abraham is director Policy of the Centre for Internet and Society is a Bangalore based social entrepreneur and Free Software advocate. He founded Mahiti in 1998, which employs more than 50 engineers today. Between June 2004 and June 2007, Abraham managed the International Open Source Network a project of United Nations Development Program's Asia-Pacific Development Information Program serving 42 countries in the Asia-Pacific region.

ZainabBawa works as an independent researcher on issues of urbanism, governance and impact of technology on political practices and institutions. Currently Bawa is pursuing her Ph.D. from the Centre for the Study of Culture and Society (CSCS) in Bangalore. In the past, Bawa has traveled extensively and has worked collaboratively with researchers in Kashmir and in Bangladesh on issues of space, conflict, violence and their impact on society.

AbhishekHazra is a visual artist based in Bangalore. His work explores the intersections between technology and culture through the narrative device of a 'visual fable'. He is interested in the social history of scientific practices, and his current, ongoing project attempts to explore the history of science research in colonial India. Hazra works with animated shorts and digital slideshows that often integrate textual fragments drawn from fictional scenarios. He is also interested in the way in which the languages of science journalism and information visualisation participate in the complex dynamics of 'knowledge dissemination' and 'translation'.

P. Vigneswarallavarasan is presently Assistant Professor in the Department of Humanities and Social Sciences at Indian Institute of Technology Delhi. He obtained his PhD (Sociology) from the Indian Institute of Technology (IIT) Kanpur. In the last few years Dr. Ilavarasan did extensive research on the culture of the IT industry, India's booming sector since the mid 1990's.

Rein Jansma is architect of many public buildings and mobility throughout the Netherlands, Dubai, Georgia and more. Around 1990, together with Moshe Zwartz, Rein Jansma founded Zwartz&Jansma architects. They build soccer stadiums, railway stations, bridges, tunnels and other mobility infrastructure. In 1992 Zwartz&Jansma created the Dutch Pavilion on the world expo in Seville.

PriyaKaul is psychologist and a practicing therapist in Bangalore, India. She is consultant with CWSolution, a firm that facilitates workshops on leadership development, cross-cultural awareness and professional skills. Kaul has over 10 years experience with business development.

Geetha Narayanan has been at the forefront of the developing digital industry in Bangalore, India's renowned ICT centre for several decades now. Being the founder and director of the Srishti School of Art Design and Technology, she has been developing and implementing programs that blend design thinking, problem, project or place based learning with new digital technologies. Geetha Narayanan is formally trained in mathematics and international education. Currently she is

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JogiPanghaal is concerned with the shift from product to service design, with a special focus on how craftsmanship and traditional artisan communities can be an inspiration for the design of services in current modern societies. For many years Panghaal was a contributor to Doors of Perception, a conference and network in which design, industry and social science collaborate to develop new ideas for service design. Panghaal graduated in Product Design from the National Institute of Design (NID) in Ahmedabad, India in 1977. Mr. Panghaal has been a visiting teacher at National Institute of Design in India, ID, at Les Ateliers Paris, at the School of Planning and Architecture, Delhi and at the GerritRietveld Academy in Amsterdam.

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MartijnWarnier graduated with a Masters of Science in Cognitive Artificial Intelligence from Utrecht University, the Netherlands, in the beginning of 2002. He did his PhD in the Security of Systems group at the Radboud University in Nijmegen. His research focused on Language based Security and the mathematical formalization of properties such as non-interference, confidentiality and integrity. For the last three years he has worked as a Postdoctoral Researcher in the Intelligent Interactive Distributed Systems group at the VU University Amsterdam. Since September 2009 he is appointed the position of assistant professor at the TU Delft. His current research interests, besides security, include the interdisciplinary research field of Computer Science and (Computer) Law, and Self-organizing and Autonomic systems. In his free time MartijnWarnier loves acting in the theatre.

Rebekah Wilson obtained a degree in Composition at Victoria University of Wellington, New Zealand in 1996. Working as an independent composer, electronic musician, installation artist and filmmaker Rebekah Wilson has performed and lectured in many venues and festivals. Earlier this century she held the position of Artistic Co-Director at STEIM (Studio for Electronic and Instrumental Music), where she curated and participated in international festivals, workshops and education programs for live electronic and instrumental music, installations and film. Since 2004 she is the co-founder and director of technology for an international software development company, Source-Elements, delivering high-fidelity real-time audio delivery over IP. She is currently living between Barcelona and New Zealand and has taken up surfing.

