Technical Foresight Report
Mediated Futures

Magnus Boman & Charlie Gullström, December 2013

Executive summary

This report outlines trends, challenges, and opportunities relating to the future of Smart Spaces and ICT-mediated human communication, as observed from within one of the EIT ICT Labs focus areas: Mediating Presence, during 2012-2013. The study should be seen as an initial and open-ended exploration that seeks to contribute a productive point of departure for more ambitious work, which will be undertaken across the Smart Spaces Action Line and using the Innovation Radar platform in future years. In particular, the business potential of mediating presence is the focus of a forthcoming 2014 Foresight Technical Report.

As a foresight, *Mediated Futures* identifies and exposes future themes with high innovation potential relating to presence technologies, using a time frame roughly six months to five years ahead. Its purpose is to create a common outlook on the future of ICT and to establish a shared vocabulary and fruitful methodologies for future strategy thinking across the EIT ICT Labs nodes and partner organisations.

A series of workshops and other collaborative activities have been organised within the Mediating Presence activity over the last 15 months. The pivotal output is a series of *one-pagers*, short fictional texts, three of which can be encountered on the following pages. Tentative and possibly provocative, these are slogan-based descriptions of future scenarios that serve to trigger new perspectives. A total of six clusters of topics were covered by one-pagers:

- *Data doubles*
- *New magic*
- *Luddites*
- *Socialites*
- *Future of Work—A working future*
- *Spaces and things*

Extrapolating, the following foresight results (organised in three parts: trends, challenges, and opportunities) represent our key findings.

Trends:

- 'Beyond 2020' mobile communications (5G) goals are creating a strong wave of new technologies, caused both by technological push and by strong demand.
- There is a user demand for *slow spaces*, physical and conceptual places in space and time devoid of digital traffic. Somewhat surprisingly, this trend is developing in parallel to that of *nowism*, instant gratification.
- Browser-based service development (WebRTC, HTML5, and a number of open source platforms), is revolutionising the media industry, re-defining the role of the Web entrepreneur (as in lean Web-based start-ups).

- New manufacturing methods (like 3D-printing) are radically changing mediating presence. Local and virtual object-printing is abstracting away from physical limitations.
- Time-based processes in work as well as leisure are diminishing but still dominant, *work-on-demand* is slowly replacing *work-between-these-times*, creating new flexibility in creative processes.

Challenges:

- User expectations of computer-assisted collaborative work and play are a mix of the best technology solutions of the future and the best technology solutions imaginable in the future. Separating what is theoretically possible from what it feasible therefore presents a continuous challenge to developers of technology and services.
- Re-negotiating the balance between work and play still remains a major challenge on an individual level. While entrepreneurs always live by a 24/7 impromptu lifestyle, employers risk to reduce employees to effort-maximising units of production.

Opportunities:

- The *Metaverse*, the connection of all virtual worlds into one networked and accessible system, will create new opportunities for service development.
- The creation of *slow spaces* actually requires ICT to remain silent. Monitoring, interference, and control of such spaces are examples of areas with new innovation opportunities.
- Remote physicality (creating and manipulating objects and environments from afar) is affecting all senses, as well as production, mobility, professional collaboration, and social interaction. All of these application areas present new innovation opportunities for researchers and developers.

Data Doubles

A person leaves digital traces. If you try to track down a person through digital traces, you will find that this is impossible. What you can model is another entity: the data double of the person that left the traces. Digital technology makes possible and yields the breakdown and dispersion of an individual, destroying the very definition of the individual as something indivisible.

Our real identity is often idolised. Yet we occasionally get the feeling that we can lose it. Especially if we reason as if we had more than one identity, that is, if we put our real selves in the mix with our data doubles. Every internet update we make co-creates the data double(s). Are these, or can these be, collected? If so, can they be extrapolated into the future? By whom, and for what purpose? Who was I (in this identity), who am I now, who will I (choose to) be later? Can I become someone else, someone that has existed before? Can we ever again be granted freedom from our data doubles? Or are they like the milk that you cannot throw away, ever, because the intelligent fridge scans your discarded cartons and keeps ordering more of the same?

There are almost solely positive updates in the digital social world. Are all those updates without consequences? Are we not allowed to be unhappy? The 24/7 monitoring of our health. No suicides allowed seems to be the policy. Surveillance permeates our lives. Superficial measures surround us: quantitative now, where before they were less superficial and qualitative. Can you ever feel lonely again?

Life expectancy curves, do they pertain to our data doubles too? If not, what do they do to our presence and to how we perceive reality? An app that determines your pulse and temperature from the image of your face. And you do not look well...

Taking mediation seriously, you stay put in one location, causing or risking isolation of you: your physical self. Augmented reality is different from mediated reality. In the mediated courtroom, there are no more boundaries of distance or fear of testifying, no more flight risk among the accused. Electronic chains, smart prisoner's clothes, and implants are in place. The robotic judges have physical embodiment, meaning human proxies for virtual; a game changer, like the autopilot that lets a human fly the space shuttle only under ideal weather conditions.

> Life after death, through mediated presence. If you learn that your (sic) life expectancy is now 20 years, create an extra eye, train it, and use it after you are dead. It mirrors you. And when no one reads your tweets anymore (after you are dead), you will die (again). After death there are no more implications. There, our data doubles are freed from us, and from our bodies. The dead can have love affairs and fight each other.

New Magic

Mediating Presence (in its different forms and appearances) will have a greater impact on our near future than we could previously anticipate. New light-weight systems are so easily deployed that they represent a kind of magic. The holistic effect of new magic, as opposed to just aggregating many small pieces of new ICT, offers possibilities to break free from old structures and the problems that are inherent to these. In particular, magic can provide tricks that hide ICT, leading people into ubiquitous and ambient forms of working and living.

One example is shape-shifting robots that self-organise in teams and in their own components, as in claytronics (combining nanotechnology with computer science), enabling novel forms of communication. All senses, not merely seeing and hearing, are involved in giving users an experience of digital environments indistinguishable from reality. Information will escape its flat structures to emerge in three-dimensional forms able to physically interact with human beings. *Let's invent new robots now!* Robots assist us, for example, as talking lights to help the visually impaired; or 24/7 video streams that appear from everywhere, all the time. Regardless of the many issues that threatened the implementation and deployment of Street View, this is already ubiquitous; military applications inadvertently paved the way for our high-resolution views, we were hating Street View before we loved it, remember?

A distinction can be made between science fiction and new magic: the latter has a shorter time to market while the former has a more distant, if any, future. But sci-fi provides us with ideas, like the holodeck on the Star Trek starship Voyager. Tele-immersion is the new ICT that allows for people to 'physically' interact inside a simulated environment, removing the geographical distances. *Let's reinvent business travel now!* Rest assured there will be more comfortable solutions for achieving augmented reality than pulling out a smartphone or some wearable device with apps that dry up your battery; more comfortable than glasses or contact lenses too. A digital drawing device or a tablet can feel like paper and act like paper. No cables or remote controls. Any user can co-create, without programming. Ambient displays lead to ambient presence. Monitors and interaction surfaces are becoming pointable. You create screens with colour-changing paint, and spray-on antennae. Houses become dynamic when built with self-organising bricks. (You have to find your way to the house, which constantly changes, yourself.) The augmented hospital is adapted to patient in-flows.

Holographic environments first recognize the presence and movements of people and objects, secondly track those images, and thirdly project them onto a stereo-immersive surface. Holographic sound was invented more than 40 years ago, but here is an environment where it has a real purpose. Tele-immersion through holography for business- as well as private conferences, like having dinner together with your family. Some family members present might have lived 200 years ago, others might have yet to be born: new magic can remove not only space-, but also time limitations. *Crowdfunding is realising dreams, so does that make crowdsourcing a mild form of ESP?* Are those dreams the dreams of individuals, or of a collective mind? What if we can copy our minds, fully functional, and what about copying ourselves? Uploading, will it make us immortal?

Decoupling a device and its primary purpose or role leads to a virtualisation of services and hardware. Our phones already became our TVs. On The Future Tube, mashing up old and new media, you can no longer trust what you see. Every picture is manipulated. Who makes sense out of it, who understands it? Which new technologies will allow for the transfer of social protocols in mediated presence? Will such technologies allow for more tangible artistic artefacts that go beyond devices or tools: embedded, but expressive?

Luddites

The luddites, or more generally speaking those that are not techno-positivists, make you aware of their opinion that the proportion of useful information over non-useful information is rapidly dropping towards zero. Moreover, given a partition of all digitised information into structured and unstructured, it is a fact that the share of unstructured digitised information is growing. This is turning the digital world into a place more interpretable for a machine than for a person. There is nothing inherently wrong about this situation, as machines have a lot to say to each other, and we may listen in whenever we feel like it. But we do anticipate that people need to take a break at some point from trying to interpret the information present in the world that they inhabit.

The real world must hold silent spaces: places in which no person is trying to interpret digitised information. In silent spaces, there is no need for meditation or actively pursuing anything. To skype someone in a silent space is rude, whereas to talk to someone is not necessarily so. Silence here alludes to rest, but not from everything, merely from interacting with machines or with digitised information. It is about replacing that common cell phone reply "Where are you?" with "Not now!".

The digital identities that people create for themselves are a reflection of what people like to be, how they like to see themselves, and not what they truly are. The amount of time spent on the Internet is growing, but interestingly enough, especially for leisure. This is in stark contrast with the industrial revolution that came about to improve work production.

A hand-written letter is now an example of a meaningful approach to communication, and several companies offer recognition tools already. Delivery of messages does not necessarily have to be optimised with respect to delivery times either. Knowing that it will take three days for a letter to arrive, and that there is an uncertainty to its final arrival, are factors that affect the contents of the letter, for better or for worse. There is also natural quota to be applied to the number of letters maximally sent in a day, unlike emailing, where the sky is the limit, it seems. To isolate oneself, like a hermit, may mean to act less like a hermit than as a computer-savvy person who knows when to shut off all devices.

Mediating presence is here done with a scaling down in mind. Not for megacities, not for broader information highways, but for more restful and hoepfully thoughtful interaction. Some technology will have to be sacrificed for this to come true. Increasing the cost for communicating is also a price any Luddite would be willing to pay. To pay for secretary services, for not having to care, for butler services, are attractive options. No more new technology or services if we can already do the job. The non-inventing of Facebook and the 'detwittering' of society is at hand.

> *Nuolenpääkirjoitus - cuneiform - cuneiforme - cunéiforme - kilskrift - Keilschrift – wigformig*
>
> • *I don't want to remember everything!*
>
> • *Design for solitude!*
>
> • *Let's kill all the creative people!*
>
> • *Slow means efficient!*

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Initiated in 2011, the Mediating Presence activity was formulated by Charlie Gullström and Caroline Nevejan, two researchers with shared interests in presence design and how smart spaces can support new forms of interaction in a mediated future society.

Seeking to explore the future potential of presence technologies and their various applications, the activity was organised as a series of interdisciplinary workshops, each attracting a wide range of participants from the EIT ICT Labs partner network, but also with contributions from artists, architects and designers. During 2012, a network of SMEs has formed around the activity, which is increasingly dedicated to the development of innovative applications of presence technologies, for the private sector (future of work, multi-party distributed work collaboration), as well as the public sector (mediated hospitals and courtrooms in collaboration across Europe).

Having thus secured a creative milieu for the meeting of minds, the activity proceeded to develop their tasks following the business plan. On several occasions, the activity has also specifically addressed future forecasting themes, such as those now documented in this report. The SMEs have been engaged in the development of business concepts driven by their own opportunities and areas of business.

The report Mediated Futures thus represents the first steps in terms of how foresighting studies can be conducted as part of an EIT ICT Labs activity, both as a clearly forward-looking exercise and at the same time connected to the efforts of innovative businesses like the SMEs.

A similar but also a broader investigation across the Smart Spaces Action Line as a whole, will be taken in 2014 - through its three priority areas in Smart Retail Experiences, Smart Urban Experiences and Smart Office Experiences.

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This foresight was written by **Magnus Boman** (Innovation Radar lead) and **Charlie Gullström** (Mediating Presence lead), with contributions from **Kåre Synnes**, **Julian Kattinger, Henrik Fälsch**, **Matti Nelimarkka, Alex Jonsson**, **Catholijn Jonker**, and **Kim Nevelsteen**. The main recipient and stakeholder is the lead for the Smart Spaces Action Line, **Petri Liuha**. Parts of the visual documentation, as well as some of the photographs, were made by **Jonas Söderberg**. Marco Rozendaal and Nienke Hollenberg (user experience consultant at Microsoft) produced 52 scenario cards.

Rapid prototyping and theoretical discussions

Presentations by guest experts

Fig-1: The workshops have attracted contributors from many different fields and with different interests in presence design, and over time this has contributed a creative milieu for future foresighting.

This report covers all the foresighting done within the activity Mediating Presence, led by **Charlie Gullström** and **Caroline Nevejan** in 2012 and by Charlie Gullström in 2013. The activity has been organised around a series of creative workshops (Fig-1), dedicated to different themes, and with contributors from artistic, scientific and technical fields. Within this interdisciplinary framework, the activity has sought to develop future strategies and support innovative product development relating to

presence design. It was produced over a relatively long time and based on several workshops, feedback sessions and review rounds. We are indebted to all the participants at these workshops who have contributed valuable input and feedback:

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1 Introduction

This technical report is part of the foresight driven by the thematic Action Line of Smart Spaces. The scope of the report is not the entire Action Line, but the ambition has been to describe parts of the Action Line relevant to the theme of Mediating Presence. This description is intended to be used as a steering document for parts of the thematic work, and so the chief stakeholder is the Action Line lead. It is also intended to inform EIT ICT Labs as a whole on those strategic questions that directly or indirectly are associated with the theme. In particular, the report aims to identify key scenarios, trends, challenges and recommendations in regard of the Action Line to better understand the enterprise aspects. This foresight will help expose future themes with high innovation- and business potential, based on a time frame of about five years ahead.

The report has a somewhat unusual format and some of the presentation and conclusions are unorthodox. This is intentional: the way the work has been performed within the theme also diverges from the typical path, and the presumed uses of this report again differ from the uses of all the foresights published earlier within EIT ICT Labs. The chief output is the so-called one-pagers (three of which were presented at the beginning of this report, and three more in the appendix): provocative and slogan-based descriptions of a future scenario meant to challenge the reader, and perhaps push the reader out of his or her comfort zone. It was edited to make extractions from it possible (as in using only one or two one-pagers, for instance), for use as a backdrop to future discussions within many Action Lines, not only Smart Spaces.

The one-pagers have been iteratively refined, the first three over a full year, and they employ language game techniques. The latter include deliberate spelling errors (*hoepfully*), questionable information (*Did the holodeck not debut on Enterprise rather than on Voyager?*), and introspective techniques like multi-linguality (writing a word in seven of the languages employed within EIT ICT Labs and witnessing and discussing the concept drift that this leads to).

While earlier published foresights have occasionally been used as background material for workshops, the present report has had some of its parts validated not only by thematic experts, but also by various groups of students. A special eye has been kept on the critical side of technological development, use, and appropriation.

In the chapter that follows, the general foresighting themes that emerged from collaborative work with Smart Spaces experts to form the backdrop for the one-pagers are presented. In Chapter 3, the methodology is described and motivated, in some detail; this chapter can safely be skipped for the reader not interested in the methodological aspects of networked foresight. The final chapter offers a conclusion kept relatively short, since the most important observations were presented already in the Executive Summary at the top of this document.

2.1 Mediated Futures Perspectives

In the various discussions, brainstorming sessions, and collaborative work carried out within the theme, six themes emerged. While not disjoint, they are distinct enough to warrant a division of what mediating presence in the future may entail, and they are each given a sub-section in this chapter.

2.1.1 Data Doubles

The term *data double* was arguably introduced by Foucault [18] and later used in surveillance studies to denote a purely virtual version of an individual [19]. This is different from a cyborg, which mixes the body of an individual with new technology for the purpose of super-human capacities or to diminish a human handicap, as in intelligent hearing-aids:

Contemporary science fiction is full of cyborgs — creatures simultaneously animal and machine, who populate worlds ambiguously natural and crafted. Modern medicine is also full of cyborgs, of couplings between organism and machine, each conceived as coded devices ... By the late twentieth century, our time, a mythic time, we are all chimeras, theorized and fabricated hybrids of machine and organism; in short, we are cyborgs. ([20], p. 149)

The digitization of data allows for information to be packaged and sold as a commodity. This mercantilization of information was discussed extensively already in the early days of the Internet [27], but came even more to the fore twenty years ago, with the implementation and widespread use of the World Wide Web. Recently, it has been law-enforced for operators in many countries to store some of the digital traces of individuals, for the purpose of crime investigations, for example. Call data, mobility data, and social network data are typical instances of such digital trace collection (see, e.g., [29]), but there are also other forms of collection and storage, like CCTV recordings. The rationale is to characterise the individual via her data double (see, e.g., [4]). Digital traces are data packages of some value [3] and might be a means to competition in commerce and innovation [23]. This value is assessed and paid for by individuals, companies, government agencies, the entertainment media industry, or combinations of those, and so the storage represents a mercantilization of information [27]. It has been suggested that a whole new economy might be developing around digital traces: a Second Economy [2], or a kind of economy of reputation [25].

2.1.2 New Magic

Hyperreality is when and where reality becomes indistinguishable from simulation [6]. The term *data double* is in fact an example of a hyperreal construct. The hyperreal is a condition of human perception, in which our imagination becomes unnecessary [4]. The real is reproducible, as in a perfect simulation, so anything we might perceive may be replicated any number of times. The point of separating the real from something imaginary then becomes moot, and the real becomes a hyperreal: all the perceptions and all the models rolled into one.

If this very theoretical view is combined with the current pragmatic view of technology as a strong force of rapidly developing means to perceiving the world and the information in it, faster and faster, and more and more accurately [1], then 5G and IPv6 are part of the new magic: the point where we lose all conception of what is real. The person I am talking to via video link is then perceived as sitting next to me. In addition, programmable matter can make the physical materials (books, tables, windows,...) on camera morph in real-time, assisting in the illusion. In the original paper on how the physical properties (shape, density, optical properties,...) can be made or perceived to change, Toffoli and Margolus wrote a very short abstract:

This paper is a manifesto, a brief tutorial, and a call for experiments on programmable matter machines. ([31]:263, italics in original)

Things appearing as video tricks or sleight of hand are then real, in some sense, and what is perceived as real becomes hyperreal. This is simply what happens when we need not distinguish anymore between the real and the simulated: when our senses (and perhaps even our subconscious) no longer need refer to something as original and copy.

With it goes all of metaphysics. No more mirror of being and appearances, of the real and its concept; no more imaginary coextensivity: rather, genetic miniaturization is the dimension of simulation. The real is produced from miniaturized units, from matrices, memory banks and command models — and with these it can be reproduced an infinite number of times. It no longer has to be rational, since it is no longer measured against some ideal or negative instance. It is nothing more than operational. In fact, since it is no longer enveloped by an imaginary, it is no longer real at all. ([4]:3)

A simple example would be that when video conferencing was first introduced, it was a new and potentially revolutionary technology. It was expensive and exclusive, and anyone using it would be aware of this feeling of exclusiveness. Today, when (at least in the first world) videoconferencing is ubiquitous, we do not have a problem of picturing ourselves in all sorts of situations in which videoconferencing plays a role (cf. [28]). In a way, all our videoconferencing opportunities become knitted together in the fabric of our imagination. We might picture ourselves as working, leading a family life, doing e-sports, etc., all enabled on some kind of ubiquitous 5G-platform (cf. [14] [15]).

The general term for what results from connecting all possibly hyperreal systems is *The Metaverse*. Within the ICT literature, a slightly more narrow focus to virtual worlds is often used. The needed ICT developments have recently been summarised as [13]: realism, ubiquity, interoperability, and scalability. Early examples of open source virtual world toolkits include *Open Cobalt*™ and *Solipsis*, the latter developed within France Télécom. A recent example currently under development is *Sirikata* [11].

2.1.3 Luddites

The 'always-on' mode of connecting with friends, family, colleagues, news, and societal affairs has given many people a feeling of being 'on top of things': knowing what goes on and being in control. The new kind of luddites here described is neither

an organisation, nor a movement, more a widespread attitude that since 'always-on' in actual fact never lets you know all that is going on and never puts you in full control, it is an illusion not worth pursuing. Trying creates more stress than not trying, and blocks out deeper reflection and thought. Hence, this attitude insists on charging one's batteries by going completely off-grid, at least occasionally.

A conflicting attitude is *nowism*: instant gratification. This is what causes a person to cancel an online purchase because the checking out takes a few seconds too long, jumping to another site to get the product. Nowism also drives prosumers and early adopters. In particular, young people in these times are more aware of new product launches than their parents, and some display a tendency to classify last year's camera or smartphone as 'junk' based on its specs (like the number of pixels). Google launched *google now* for smartphones in part for meeting the demand for *Now!Search*: searching for information about things close to you, in time or space. An example would be *Why is there smoke over the northern suburbs of Stockholm?* or *Who won the local football cup for 9-year olds in Espoo this evening?*. Nowism also comes with a scepticism towards futurology [23]: why try to predict the future when the devil is in the details, and there is so much serendipity? History also risks getting twisted by ease-of-finding information factors.

Even though the luddites and the nowism attitudes offer conflicting views on the current, they have one point in common, namely to be in the present. In the classic words of Horace: *carpe diem, quam minimum credula postero*. It might seem that the ICT shunned by the luddites would be embraced by nowism, but in fact the luddites too depend on state-of-the-art technology. For instance, in order for a meeting room to be silent, or a *slow space*, it could be necessary to actively block out radio traffic from the room. Pervasive computing and calm technologies are examples of recent terms emerging from engineers. Where the luddite and nowism attitudes meet is in a cognitive state of presence, of being fully aware of the situation at hand, arguably best described more than 50 years ago by *Situationist International* [12]:

Our central idea is the construction of situations, that is to say, the concrete construction of momentary ambiances of life and their transformation into a superior passional quality. We must develop a systematic intervention based on the complex factors of two components in perpetual interaction: the material environment of life and the behaviors which it gives rise to and which radically transform it.

2.2 A Systemic View: Our Mediated Culture

Our social and cultural practices are currently exposed to a thorough reformulation, empowered by the connectivity of the new network society, such as articulated by Castells [7] [8] [9] [10]. Society currently faces increasingly complex challenges and we need to facilitate sustainable patterns of behaviour, accepting that the boundaries between the natural and the technological have been repeatedly called into question [21]. In our society of ubiquitous computing, technology has encroached into how we 'enact being alive'. Viable communication solutions require creative and innovative thinking on a number of levels, not least ethical concerns for our new 'cyborg identity'. How might we navigate between our natural and a range of mediated presence(s), as currently designed by presence and transaction technologies, social network technologies, surveillance and identification technologies, etc.?
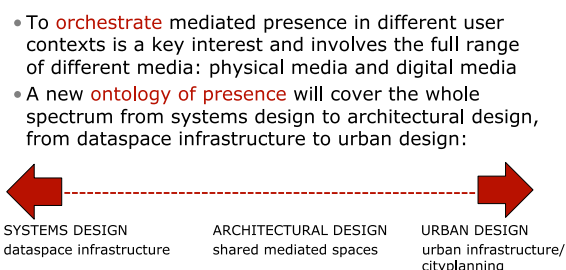
What are the unstated boundaries of one's profession? It suffices to agree with Simon's claim that we live in a world of artificial artefacts designed by humans [30]; with Haraway's argument that new technologies have become inseparable from our bodily identities [21]; or with Castells that social change requires the ability to shape the human mind, the most fundamental form of power [9] to realise that disciplinary boundaries are due to be dissolved.

What we refer to is a paradigm shift that affects all stages of contemporary cultural communication: design, production, distribution, storage and exhibition, and all kinds of media – texts, still images, moving images, sound and spatial constructions. This means there is an important potential contribution of architects to a currently heterogeneous research field, which spans media research, cognitive science, presence research, interaction design, ubiquitous computing, second-order cybernetics, computer-supported collaborative work, communication theory, etc.

To strengthen the area of connected media and ICT-mediated human communication, in ways that address and involve the full range of different media (Fig-2): we need to work across all levels, from systems design (dataspace infrastructure), to architectural design and applications for urban infrastructure and the planning of future digital cities.

ICT-mediated Presence

- To orchestrate mediated presence in different user contexts is a key interest and involves the full range of different media: physical media and digital media
- A new ontology of presence will cover the whole spectrum from systems design to architectural design, from dataspace infrastructure to urban design:

SYSTEMS DESIGN
dataspace infrastructure

ARCHITECTURAL DESIGN
shared mediated spaces

URBAN DESIGN
urban infrastructure/
cityplanning

GULLSTRÖM & NEVEJAN, ICT-Labs workshop Amsterdam 110329

Fig-2: The full range of media addressed in the Mediating Presence activity.

Recent technological development, over the last twenty years, has had a fundamental impact on the nature of human communication and interaction, and thus necessarily affects how practices in society are organised and designed, how professionals work; and how academics and the pedagogic platforms are structured. Educational institutions are still standing on the threshold of an important development and application of digital technologies.

Future applications of new (digital, immaterial) design materials are now used to conceive hybrid architectural spaces and responsive architectural environments and buildings. There are many examples of digital and immaterial design materials and building materials which are increasingly incorporated to our every-day use of buildings, thus prompt our behaviour as users. Like Carlo Ratti and the MIT SENSEable City Lab shows, the ubiquity of mobile devices and telecommunication

networks with large banks of geographical data and digital design materials (e.g., Bluetooth, RFID, cameras, micro controllers, sensors, etc.) allow us to re-consider and re-design the interface between cities, people and technologies in ways open virtual spaces and thus extend our everyday interaction spaces. Advances in microelectronics make it possible to spread 'smart dust', i.e., networks of small wireless microelectro-mechanical systems and materials, sensors, robots or devices (MEMS).

How such digital or immaterial design materials may be integrated to our physical environments is naturally already an important focus of study. Inside Smart Spaces, there is the company *Holland Haptics* and their *Frebble*™ tool. SpaceGlasses is a fascinating external example 0.

3 Methodology

This chapter explains the ways in which the results presented in the beginning of this report have been elicited. It can be skipped without loss by the reader not interested in the business process of the EIT ICT Labs networked foresighting *per se*. The elements of this process include structured brainstorming, speedwriting, plus all the traditional elements of foresighting. The perceived value and impact will be covered in the conclusion (Chapter 4).

3.1 Eliciting Knowledge from Thematic Experts

The Innovation Radar has since 2012 run a series of workshops with the intent of eliciting input from thematic experts, chiefly in the form of written text. The thematic is determined by the Action Line ordering the workshop, so in the material covered in this report the main stakeholder has been Petri Liuha, the lead of the Smart Spaces Action Line. The text was produced via the following methodological steps.

A. Introduction to speed-writing

B. Explanation of thematic delimitations

C. Trend/Idea/Concept generation

D. Clustering

E. Formation of writing groups

F. Speedwriting

G. Explanation of next steps

H. Post-workshop work

The eight steps in this sequence will be explained in the next sub-section, via a concrete case. Naturally, the expert input elicited has been presented also in various other guises, including PEST-diagrams, radar screens, and knowledge repositories.

3.2 Case: Mediating Presence—On Relation

The concrete case is a workshop hosted by the Mediating Presence activity in Stockholm in September, 2012 (Fig-3). All in all, four workshops were organized in 2012, each on a separate theme derived from Charlie Gullström and Caroline Nevejan's shared research interests in presence design: Place, Time, Action, and Relation (Fig-4).

Fig-3: A Mediating Presence Workshop in the EIT ICT Labs Presence Lab, a former nuclear reactor hall on KTH Main Campus Stockholm.

Fig-4: Mediating Presence End-of-Year conference in Delft, November 2012. Presentation of artistic research, product innovation, and demo of a 3-party collaboration space.

The description below will focus on one half-day Innovation Radar-led seminar, part of a three-day workshop dedicated to the theme "On Relation", within the Mediating Presence task in Smart Spaces. This half day saw 16 participants go through the sequence of steps above over the course of an afternoon. This seminar was selected as a case here because it was the initialisation of the work that ultimately led to the one-pagers presented in the next chapter.

Part A saw the rules, documentation, and all other relevant aspects of collaborative writing introduced to the participants by Magnus Boman. Several of the participants had attended similar workshops before, and a few had also tried out speedwriting as a part of those earlier workshops. In part B (Fig-5), the delimitations were explained; first to Smart Spaces, then further to Mediating Presence, and finally to Relation.

Fig-5: Participants listening to the introduction, at the Stockholm CLC (step A) and explanation of thematic delimitations (step B).
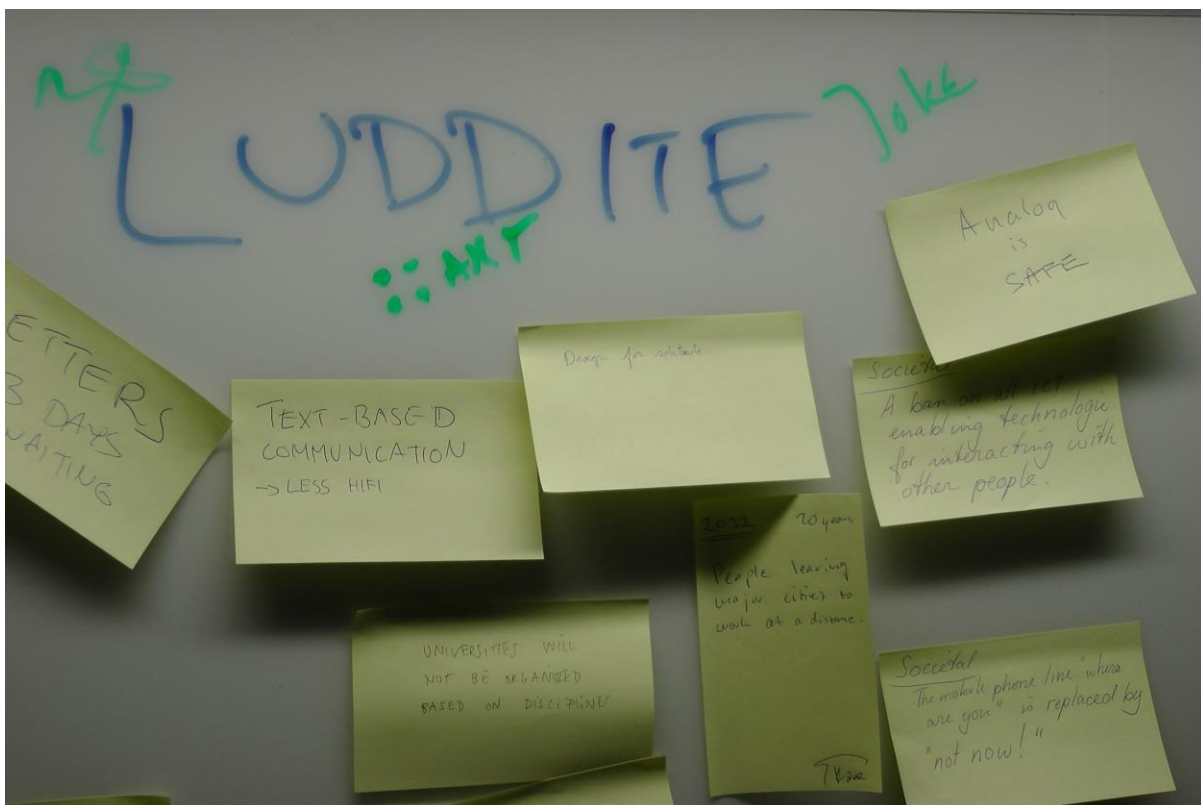

Fig-6: Close-up on Post-ITs placed on the wall (step C).

Step C uses Post-ITs for noting down trends, ideas, and new concepts. While the format can be constrained in various ways—the Innovation Radar workshops has often used a format of name, description, maturity, impact, drivers, and obstacles—this time, the format was completely free (as can be seen from the examples in Fig-

6). This freedom was opted for because of the heterogeneity of the work cultures and backgrounds of the participants: a strict format was deemed to have constrained thinking unnecessarily at this early stage. The Post-ITs are written individually, but the participants may move around, discuss, and seek inspiration from the Post-ITs already placed on the wall by others. Participants are also free to move Post-ITs, so as to start clustering similar ideas, and to write preliminary names for clusters on the wall (Fig-7). The timing of each step is moderated and slightly rushed by the seminar leader, so as to remove the censorship of ideas that usually sets in during deliberation.

When all the Post-ITs are on the wall and clustered, the entire group comments on the initial clustering. The cluster names are voted on, in the sense that each participant chooses two favourites. Ideally, a schedule for the next step can then be made by the seminar leader, in which each participant gets into a group discussing the topics chosen, in two consecutive sessions. This sometimes calls for heavy moderation, and changes to the original clustering. In this case, scheduling (step E) was quite swift, but eight clusters were narrowed down to six, loosely corresponding to the one-pagers presented in the next chapter.

Fig-7: Discussing a cluster dubbed Work, while new Post-ITs are still being added (step D).

Fig-8: Ongoing discussion in of the three groups in the first round (step F).

A leader is chosen for each group. It is important that the leader understands the topic to be discussed, since he or she will also do the documentation, i.e., the actual writing. The leader is the one doing the actual speedwriting (step F). Ideally, the leader will also be active in the discussions. The Post-ITs in the cluster under discussion are on the table, acting as points of origin. In Fig-8, Michal Dunaj (with computer, centre) is the discussion leader, while Magnus Boman is marking envelopes in which to put the used Post-ITs, for the post-processing. All the text material is kept (scanned as necessary, and stored), and the proceedings are documented in pictures and video, should any future analyses be necessary or desired. After such an intensive session, there is a short break, and then the next round begins. At this workshop there were two rounds (3+3 clusters), each consisting of 15 minutes. Experience shows that a quarter of an hour gives about 13 minutes of pure speedwriting, which is just right for keeping momentum without too much fatigue setting in. As can be seen from Fig-9, the Stockholm CLC open café area offered a perfect mix of nearness between groups (so the seminar leader could monitor all activities, at all times) and privacy enough for the respective discussions.

Fig-9: Simultaneous discussions in all three groups, in the café area of the Stockholm CLC.

After these two rounds were concluded, all that remained was for the seminar leader to explain what would happen after the workshop (step G). Magnus Boman gathered all six documents and the other materials produced, and used these as a basis for creating a new shared document, which all participants could edit, for a limited time (step H). The document was then taken offline for more careful editing, by him and Charlie Gullström.

3.3 Validation

During 2013, earlier versions of this report have been used internally within EIT ICT Labs, including at several Mediating Presence workshops. In this process, the feedback from usage has been collected, and has been used to refine and inform this report. Some of the one-pagers have also been tested in educational settings, at two universities in Sweden: The Royal Institute of Technology (KTH) and Luleå University of Technology (LTU).

3.3.1 Validation by Experts

In June 2013, at a Mediating Presence workshop in Luleå, participants worked in groups on possible constraints relating to "Life in the Luddite Mediated Society of 2050", the title borrowed from one of the drafted one-pagers (Fig-10). Marco Rozendaal documented the result presented by each work group with illustrations (Fig-11). This inspired the production of scenario cards for insight and innovation in healthcare, for usability workshops in design thinking and forecasting. He therefore also developed a deck of scenario cards, drawing from a wider base of workshop

results, on-going research and relating to the future of mediated hospitals, a new application area and market that the activity is currently exploring with its network of SMEs.

Group 1: You are a family of five.

Discuss. Describe and illustrate your everyday household.

Group 2: You are a group of students at master level at a prominent technical university preparing a shared project task.

Discuss. Describe and illustrate your collaboration and student life.

Group 3: You are a team of teachers in a primary school, with pupils aged 9-10 years of age.

Discuss. Describe and illustrate your school day and pedagogy,

Group 4: You are all colleagues in a hospital.

Discuss. Describe and illustrate your everyday work context.

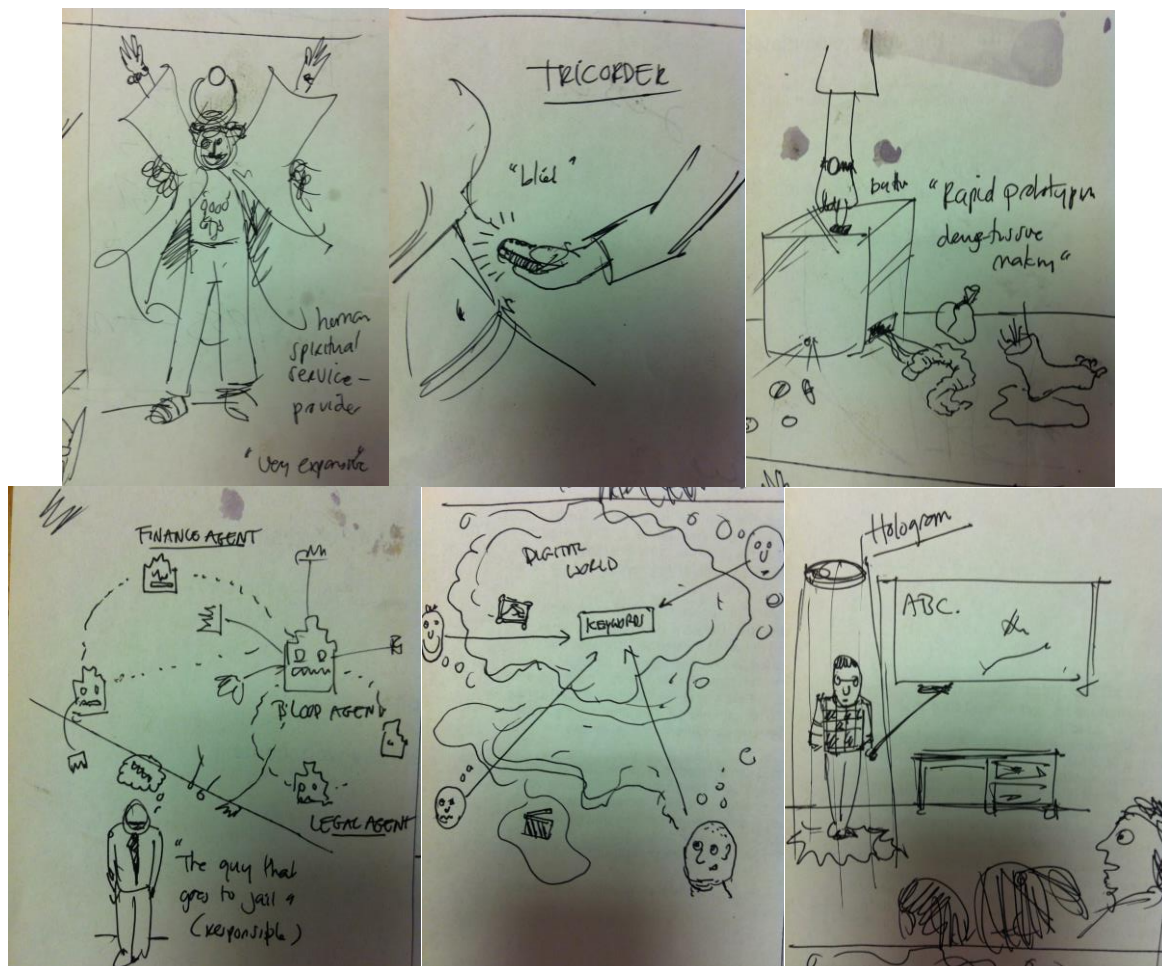**Fig-10**: Instruction to the groups.

Fig-11: Illustrations documenting the group presentations "Connecting to the cloud"; "Tools to filter social media", "Merging minds in the cloud", "Intelligent agents that do the annoying work", "The brave new world of rapid prototyping", "The human spiritual service provider", and "Global Village, Local classroom".

We combine Situated Cognitive Engineering with Value Sensitive Design into a user-centric iterative design methodology.
This methodology involves end-users and other stakeholders in the continuous iteration of analyses, development and innovation.
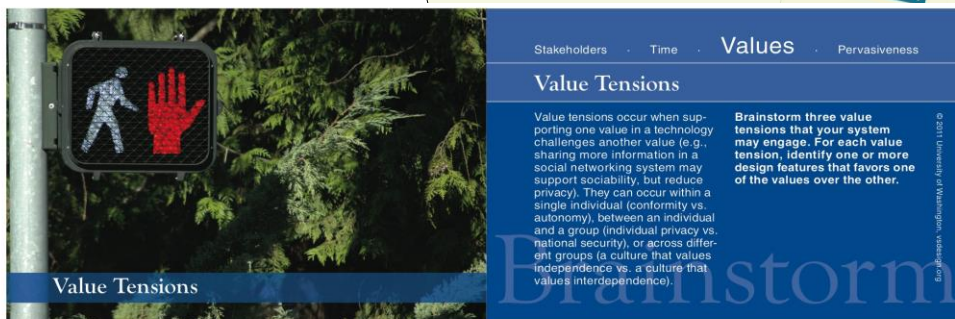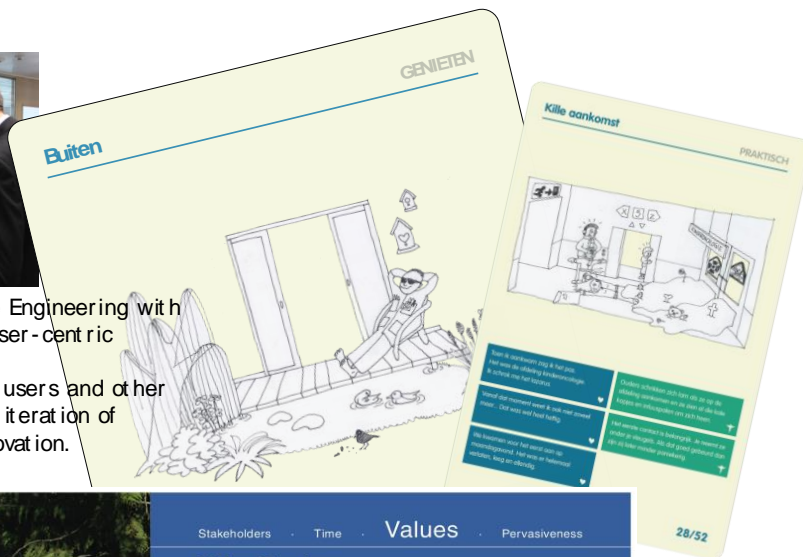
Fig-12: Various sketches of scenario cards serving to raise future-related discussion topics with users in the hospital context, as part of user-centred research methodologies.

A set of 52 scenario cards (Fig-12) has resulted from an on-going cooperation between the Princess Máxima Centre for Paediatric Oncology, Industrial Design Engineering at TU Delft, and KTH, brought together by the Mediating Presence activity. In this cooperation, the focus is on creating 'the hospital of the future' by crafting design opportunities that apply new technologies, and by tapping into the power and expertise of SMEs across the whole of Europe to realise them. The finished scenario cards (Fig-13) have been used successfully for roadmapping, design innovation and vision development.

The final result is a combined booklet and a set of 52 (printed) scenario cards which provide a creative toolbox, giving new insights into paediatric oncology. The cards tell the personal stories of families who have been confronted with cancer, as well as the stories of healthcare professionals who work hard to care for these young patients. Each card discusses a topic from different perspectives. People involved in paediatric oncology will recognise many of these issues, and those not familiar with this field will get a glimpse of what the issues are.

Designing healthcare innovations from a people-centred perspective, innovations should fit with people's experiences and practises. Understanding people and the context for which these innovations are intended takes time and requires empathy. Fieldwork and in-depth interviews are also time-consuming and not always easy in healthcare settings; children can feel ill, parents worried, and professional staff are busy with their important work. These cards provide an insight into some of the

contemporary issues in paediatric oncology in the Netherlands. The cards can be used in different ways: as a booklet to browse through, or as scenario cards (by taking out the pages) that can be used in creative sessions and workshops.
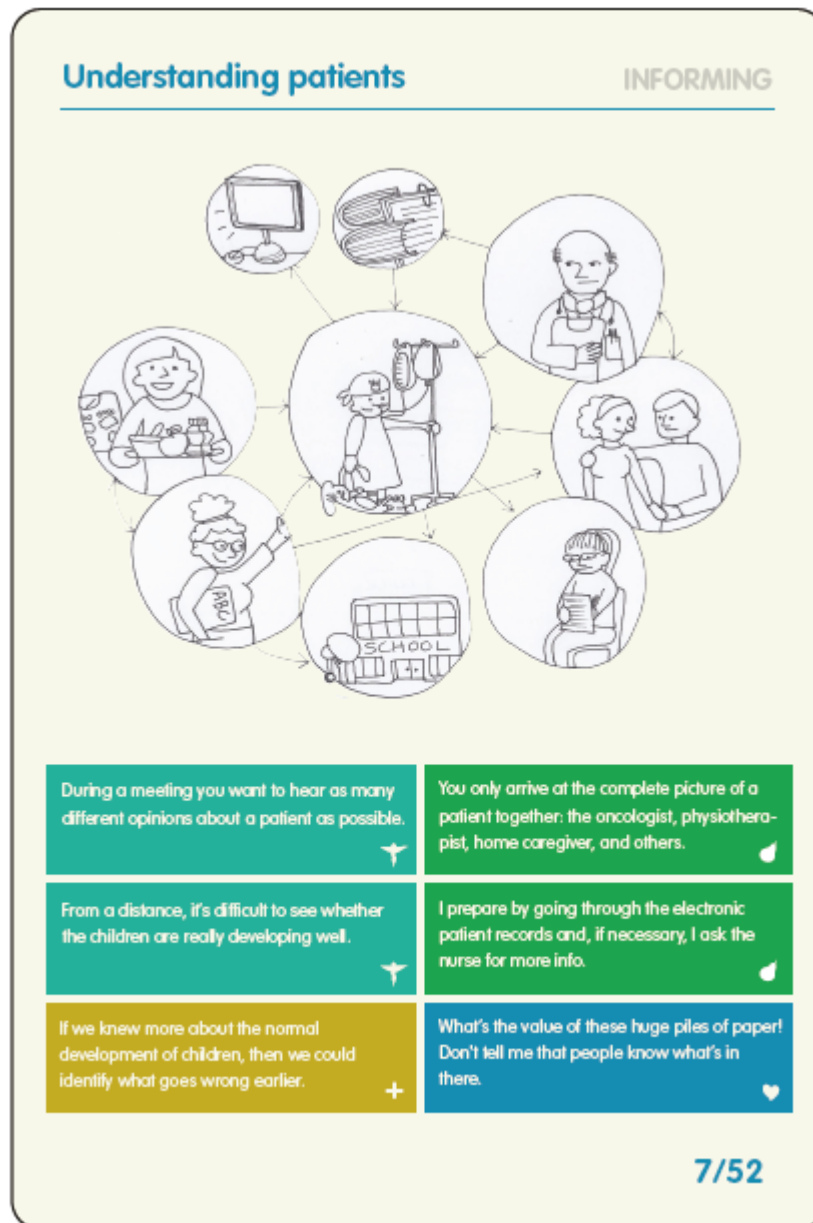

Fig-13: An example of a finished scenario card employed in discussions and planning for 'the hospital of the future'.

When envisioning design innovations for healthcare, a common ground is needed to form opinions and negotiate with designers, stakeholders and producers. These scenario cards can provide a space for dialogue and innovation for healthcare. The 52 topics are presented in categories, including 'treatment', 'participation', 'organisation' and 'information'. To allow flexibility, two 'blanks' have been added so one may define own topics and sketch a cartoon for it.

3.3.2 Validation by Smart Spaces Participants and Collaborators

At the 2013 end-of-year workshop for Smart Spaces, the participants were given the New Magic one-pager, as well as its corresponding background research text. This was used to spark open discussions, in three parallel groups. Each group was given an already in use Smart Spaces theme, according to a partition into retail, urban, and office. The output was dynamically documented, using software from one of the start-ups within the thematic: *screen.io*. A sample of quotes from that documentation follows, with examples shown here in the order that they got dynamic votes (highest first). Even if this sample cannot mirror the whole knowledge exchange, it shows how some bits of new magic got into the discussion, and that the slogan-like statements were adopted across the three existing themes:

Retail

- Localized advertisement spots: "tomatoes are rotting at the S Market 150m away from this bus stop". What is the added cost of the products if augmented with RFID and others? Especially fruit, and low-cost products. If the product can 'know' the user, it can warn for people on a diet, or health plan (allergies etc.).
- How inform the product where and what it is: can be QR code or similar.
- How could we help to make retail better? What are we talking about? — retail in smart spaces — smart spaces for retail? — or retail in general?
- Clever shops maintain their won forums, and give customer support online.
- Trend to automatically track both products and consumer. This has great potential, but also the drawback that some people reject the technology.

Urban

- Movie theatres for the 5/6 senses.
- Autonomous parking so that your car drops you off in front of the entrance and goes to park itself underground leaving the streets uncluttered.
- Controlling the weather for important events.
- Common theme around virtual tourism in urban environments.
- Collaborative art creation and sharing.
- It is not the countryside. Urban is an area outside your home and office.

Office

- Note taking is filtering. Automated note taking?
- No travel for internal meetings. We will travel less!
- For chat generation is there any dichotomy between virtual and real? They will be continuously mixed like now. We type text in virtual and chat face to face.
- How can we collocate virtually to support innovation?
- Materiality vs. Immateriality
- Mixed communication. Multiple languages in same projects and communities. Natural communication interpretation (not only language, but also gestures). Real-time language translation! Bridge cultural and language barriers.

3.3.3 Validation at Educational Partners

The purpose in this sub-section is merely to show what educational experiments with EIT ICT Labs foresighting output can look like. It can no doubt inform students of KIC activities and the output can work as a backdrop for discussions, in this case on the future of science for mediating presence.

A first student validation took place at KTH in the autumn of 2012, when a master course was dedicated to the theme of *Future of Work* (Fig-14). During the course of one semester, the students worked in groups on design projects (Fig-15) that were formulated in dialogue with researchers, professional architects and with real estate management of AMF Fastigheter, Stockholm. The group consisted of 25 students from the KTH School of Architecture and Konstfack University College of Art, Crafts & Design, Interior Design, and were taught by Charlie Gullström and Ori Merom (KTH), Anna Odlinge (Konstfack), and Peter Ullstad (Codesign).

Fig-14: Final exhibition at AMF Fastigheter, Stockholm. Architecture students from KTH and Konstfack developed collaborative design projects relating the theme 'Future of Work' during the autumn 2012.

Studio Project 3:
THE FUTURE OF LEARNING
Design a library or a new school

What is the school and what is the library in a mediated urban society? This is a real-life design problem formulated by the Educational Board of the City of Stockholm: 10 new schools are needed in the coming years (an additional 23,000 children will start school in eight years). Today, students can find facts more swiftly and conveniently on the Internet than in a conventional classroom lecture. New pedagogic models focus experience-based and problem-based learning - but what kind of spatial organization does this require? In collaboration with teachers and children from one or more schools, and supported by the responsible authorities in Stockholm, you will explore how learning and teaching could be conceived. You will develop proposals for the designs of buildings and spatial strategies, including mediated spaces and extensions for the future of learning.

Please note that as we are engaged in creating a Vertical Studio in collaboration with a Year 1 teaching team, this may have some impact on the course design. Further, the spring term includes collaboration with a design studio at the School of Architecture at University of Illinois at Urbana Champaign, Chicago, still in planning. Like our studio, the UIUC studio explores new digital technologies and we will be creating a mediated extension from Stockholm to Chicago, allowing us to sketch together using Wacom tablets, video communications and remote 3Dscanning/printing. A study trip to UIUC, Chicago is in preparation. Other possible destinations are Valencia and Kibbutz Neot Smadar, Israel, yet to be confirmed.

Fig-15: Course presentation material, taught by Charlie Gullström and Ori Merom, KTH School of Architecture, Master studio catalogue, 2013-2014.

A follow-up master course informed by the foresighting report and relating to the design of a Mediated Society 2050 will take place at the KTH School of Architecture in January 2014. The theme is *Future of Learning*.

In a later validation at KTH, Magnus Boman has used the Data Doubles one-pager for two different groups of students taking a Philosophy of Science class (Fig-16). The first group contained 20 master students in distributed systems at the KTH School of ICT, and five PhD students in computer science (one woman and 24 men in total). The second group had the same PhD students and three of the master students (8 men). Each class lasted for 90 minutes, and took place on October 2 and October 17, 2013, respectively.

The first group was taken through the whole sequence (steps A through H), but the brevity of the session forced the time for personal reflection and the discussions to be quite short. The graduate group (augmented by three volunteer MSc students) completed the speedwriting session, taking the output from two weeks before as input.

Fig-16: Students at KTH School of ICT clustering concepts resulting from brainstorming.

The following table excerpt gives a flavour of what the Post-ITs from the first group looked like. Impact (I) and maturity (M) is on a 0-10 scale, and S indicated that the concept is conceived of as a service.

Concept	Concept description	I	M	S
Emotions to go	Feel emotions, as saved on a computer, whenever we want.	7	2	y
AI-store	Storing all memories and experiences on disk, and having them self-organise and develop	8	2	
Remote and new senses	Remote touch, taste, smell sensors and actuators. How to translate different sensory inputs into interpretable or understandable inputs. Smell the atmosphere of Mars, touch the sands of it...	9	4	
Avatar telepresence	Smell, voice, (3D) imaging. Pedagogical applications. Includes scientific (and lab) work. Virtual conferences. Morphing.	8	3	y
Uploading	Conscience or mind transfer and storage. Possibly revivified minds in the future. Eternal life.	10	1	
Smart spaces	Smart boards with teleportation features.	8	1	(y)
Mental comm	Smart phones combined with implanted system-on-a-chip for communication purposes.	9	4	y
Hologram printing	Just like 3D-printers, but with holographic output.	5	6	
Shape-shifting collaborative objects	Already happening on some mobile devices.	7	3	

The second group then crossed concepts from mediating presence with the following concepts from philosophy of science.

- Paradigm (immature, normal, revolutionary) [26]
System, open system, "Offices are open systems" [22]

- Techno-positivism
Techno-determinism, philosophy of technology, STS, critical thinking, nepotism, bias [32]

- The mercantilization of knowledge [27]
Epistemology of digitised information

The students produced text after the second seminar, which will not be reproduced here, but to, again, give a flavour of what was covered, the following list of concepts is an excerpt.

- Super-functional mediation for maximising value in collaboration (5G)

- People driving tech vs. tech driving people (a critical view)

- Connected society, people *ad hoc* networking: who owns and benefits?

- Capability approach to enhancements of mind and body

- Incremental advances only for mediating presence: no paradigm shift; no ubiquity, and no self-organisation (techno-political view)

4   Conclusions

To a developer, a prosumer, or an entrepreneur in a mediated society, these are innovative if disruptive times. The dichotomies of not only analogue versus digital, but that of real versus unreal, and that of material versus immaterial, are dissolved. Resolution then comes from negotiating new ways of making objects and services, and this is how new products and ideas are made. The maker community has been afforded by a number of new practices. The largest challenge in these dichotomies becoming obsolete, or at least invalid for understanding our world, is arguably understanding the new opportunities. We still use pen and paper at times, we still buy books and play vinyl records, we still think of immaterial things as material things in order to comprehend complex objects. Modern courtrooms might not always require a witness to be physically present, but a judge can still insist. Medical images can be sent to an expert, but some experts still prefer to handle difficult cases by sitting at a physical table, looking at the same x-ray image, at the same time, and discussing it.

Fig-17: Examples of on-going changes, to be negotiated: while one of the Swedish universities part of EIT ICT Labs still sports a *Flexomat* time-reporting machine, a protestant church in the same country has embraced payments for their collect via a *Kollektomat*.

While resources are increasingly available by demand and in a spur of the moment (*hinc et nunc*), efficiency leaves little room for extra reflection, such as a short nap or a long lunch break when working. In fact, everything is a negotiation, at the best of times allowing every individual to take the time needed to see the opportunities that are there. Work, rest, and play have been reformulated into a relationship between time-based and delivery-based cultures, and this is a balance to be negotiated (Fig-17). It is only in this balance that each individual can be innovative, productive, and happy.

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Appendix

In this appendix, three texts in various stages of maturity are presented. None of the three have been subjected to more than a few iteration rounds, and for use as one-pagers they would need to be refined and shortened. That said, they give a flavour of what the remaining three emerging areas of mediating presence are, thus completing the picture of our mediated futures. They emerged from one structured brainstorming session with about 20 experts, the output of which was post-edited by various participants and then again by the editors of this report.

The three descriptions also give a glimpse of what a one-pager in progress looks like. They will be turned into proper one-pagers should the corresponding experts and the stakeholders be interested. In 2014 and onwards, the Smart Spaces thematic area will cover these and many other topics in research and development efforts.

1. Socialites
2. Future of Work—A Working Future?
3. Spaces and Things

Socialites

The main characters in any Jane Austen novel are socialites, participating in social activities, carefully respecting social norms, and spending a significant amount of time entertaining and being entertained at events attended by others of similar standing. The next generation will be brought up as digital natives. They may change their identity in the midst of a social activity, and play with their standing, their identities, their augmented bodies and their senses. What would a social situation look like, in which a digital native were brought into the perfectly constructed narrative of an Austen novel? The not so perfect real world, with all its social entropy? Would this person, or the artificial entities associated with or augmenting this person, be socially accepted? Would they be awarded with a sense of belonging?

The initial mimicry of parents may in the future be complemented and changed by virtual entities. A virtual tutor could guide daily activities, acting as a digital primer that recommends the next step to be taken and the next challenge to learn from. The virtual tutor could change its role to a mentor as the child becomes more independent. It would thus go beyond governesses, as Austen would have them. What would be missing is attachment.

The technological singularity in which artificial intelligence has progressed well beyond human capacity would radically change human civilization, and perhaps even human nature. In robot-human interplay, a collective intelligence involving multiple humans could provide the back-office wisdom and processing of daily activities. Such collective intelligence could support not just human but also robot development. But can an artificial intelligence acquire or be equipped with socialite skills?

Social groups will always be there, regardless of virtual entities. Can those social contexts in which groups are formed and maintained be extracted or designed successfully? The social strength of relations—used to rank, filter, recommend, and cluster people as well as virtual entities—would surely be a parameter. Can group sense replace nationalism and chauvinism, and will we see artificial intelligences in any of the following phenomena?

- Mediated courtrooms across Europe and the world
- Presence sensors and attention sensors
- Massively multi-player online games with physical interaction between avatar owners

A common perception is that we perceive ourselves as reflected in those we socialize with. Early attachment and a sense of belonging urges us to become accepted and perhaps to conform with respect to our identities. Identifying ourselves with pure artificial intelligence, or with a collective intelligence, would change the image in the reflection. How many intelligences will there be: a room full of Watsons for every meeting between people, or just the old idea of the digital assistant finally being realised? Our life in the next millennium will depend heavily on interactions with such intelligences. How can we support their promotion to socialites? How do we make them love us?

Future of Work—A Working Future?

Work in the mediated society will reach far beyond a simple rendez-vous in space. New time-based models will elicit highly interactive, personalised, shared media experiences, hereby replacing a previous presence-in-person-is-optimal paradigm. A reminiscence from the modern era, this was founded on synchronous work activities allocated to office-like environments, designed for tasks contracted to be performed in time-space-limited models of work by humans.

The future of work will to a much lesser extent depend on where individuals are located or where they are expected to gather by flock or tradition. In this era of work-from-home, a concern to assemble experts at a specific time will still prevail. Who can, right now, help me carry out my task? Where such a person can be found is of limited importance—whether fly-fishing, at the car boot sale or just finished co-authoring their children's home assignments—will hardly matter. The questions are rather: How soon can you deliver the output? What's your current bandwidth (mental or network-based)? Which are the available time slots dictated by our different time-zones? Physical location will naturally sometimes be of significance, at least when it comes to catering for our bodies, our spaces, and the youngest and oldest. Baby nursing can't be downloaded, nor can taking your ageing father to the beach for a view of the sun hitting the Pacific.

Time-based work models can favour both asynchronous and synchronous collaboration. New smart and hybrid spaces with cloud facilities will remember and store your individual contribution to an on-going teamwork project. And if you prefer a physical space, you can project or display shared memory spaces on various spatial surfaces. You can recreate a previous work session in order to continue where you left off last time, or if you want to know what was addressed in one conversation while you were busy in another. A shared virtual space also means that you can mediate the remote expertise you need instantly, or join another team somewhere in time and space: space on-the-go.

Smart spaces will combine material and immaterial surfaces in ways that allow you to use most of your senses, to collaborate with other parties sufficiently well when compared to being on-site (sometimes better too, sometimes still denied). New tools and various ways to access additional information will lead to an experience of being "more present than present". How will the concept of presence change over time? Architects and planners will need to reconsider the infrastructural veins, which feed larger cities.

A positive effect of mediating presence is, namely, less physical traffic when the need to physically attend meetings is reduced, and fewer indoor areas need heating. Will the environmental CO_2 targets finally be achieved? Will health authorities document healthier citizens and less instances of asthma? Or will it become a reality only when another pandemic flu hits, and where those who are prepared will get an unfair advantage over others?

As the process of work thus is preceded in the cloud, it can rather be expected that data traffic jams will have an effect on work-life, as our dependencies on cloud-stored data will increase. Latency, jitter, bandwidth limitations, server congestions, and unforeseen connectivity restrictions and new demands on integrating cloud services with local resource: how will this affect our work situation, and how can a quality-of-service be withheld?

On the manufacturing side, time-based production lines and 3D-printing will revolutionize processes by producing complete products in print-on-demand cycles, some of which may be partly designed, ordered or even manufactured directly by the consumer in the home. This revolution, in turn, dramatically changes the transport logic behind manufacturing by enabling production of any needed object at home or, in other words: digital transportation. Sceptics would claim that materials will need to be transported physically to the printing location nonetheless, and that gains will be minor. Bringing the short-series production to the home will give positive side-effects, however, as new kinds of local tech shops allow smaller commercial entities and hobbyists to gather around collective resources, thereby strengthening the local maker community.

Let's think about new structures defining the workplace. Some companies will expect employees to work hard on a continual basis for some services, while in other cases be interested in e.g. 30-minute inputs from remote expertise (let's imagine refined video-walls and interactive surfaces that facilitate this and also include metrics to determine the remote contribution in time and money). Can you hire people through a Spotify-model for accessibility and use, or even distributed and collaboratively filtered like the phonebook in services like Skype or Truecaller? What new remuneration systems will develop and who become the true heroes in our time-centric society?

Spaces and Things

In the near future, technology is not only wearable, as in Star Trek's visionary mound of transponders and exoskeletons, but rather "awareable" as in made-aware-of-surroundings. Such responsive environments naturally have an effect on our human behaviour, and many times for the better. My kettle will know me, not only my idea of the perfect temperature for brewing Sencha tea. Among the household items that have improved through awareness is the ironing board. It now safely knows to switch itself off when the last person has left the building.

So how can awareable things and spaces inform social relations? One example is by communicating the schedule of a group of people who share certain activities. This allows for seriously customised services and information can be filtered in suitable ways. An infrastructure that communicates shared media experiences in changing contexts will be one of the pillars for continued social sustainability. For years we have adapted too much communicative behaviour to suit the way computers work. Now we just talk and the infrastructure and spatial support systems will wedge out how the information best reaches the recipient.

> *Pixie: Bzzzz, trying to help you re-route this current conversation, in order to have you catch the 5pm bird to Washington. You're now good to go. You should leave this building in a few minutes.*
>
> *You: OK.*
>
> *Pixie: If you pursue this handover to Skype, you can stow away your computer keyboard and continue your conversation in the taxi, which I also ordered btw.*
>
> *You: ok, go ahead*
>
> *Pixie: Rerouting video conversation to your Skype Ultimum account, please stand by….*

The concept of space has changed. Virtual spaces blend with real spaces and we understand the boundaries between material and immaterial surfaces in a new way. Integrated cameras allow the individual to document and store personal experiences. You can have remote experiences too. Many people now use their full body replicas to travel safely.

Lifelogging is about all of my replicas and avatars too, but grounded in the new me. I sit in my room and I touch my memories. I have stored valuable scents and sounds. I have had Cleopatra's perfume recreated. A portfolio of my actions is visualised at the end of the day. I usually have most of it edited away, but I keep a visual diary to make sure I remember my psychophysical state of mind. I have special space in my flat to store these memories, and I go there when I feel gloomy.

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