ROYAL INSTITUTE
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presence design

mediated spaces extending architecture

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Doctoral thesis
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Cover photo:
A time clock in use at a Swedish industrial workplace. 'Stämpelklocka. Motala Verkstad.' 1969.
Photographer: Jean Hermanson

abstract

This thesis is a contribution to design-led research and addresses a readership in the fields of architecture as well as in media and communications. In juxtaposing the tools of the designer (e.g. drafting, prototyping, visual/textual/spatial forms of montage) with those of architectural theory, this thesis seeks to extend the disciplinary boundaries of architecture by observing its assimilation of other media practices. Its primary contribution is to architectural design and theory, and its aims are twofold:

Firstly, this thesis applies the concepts of *virtual* and *mediated* space to architecture, proposing an extended architectural practice that assimilates the concept of remote presence. Through realized design examples as well as through the history and theory of related concepts, the thesis explores what designing mediated spaces and designing for presence entails for the practicing architect. As a fusion of architecture and media technology, video-mediated spaces facilitate collaborative practices across spatial extensions while simultaneously fostering novel and environmentally sustainable modes of communication. The impact of presence design on workplace design is examined. As an extended practice also calls for an extended discourse, a preliminary conceptual toolbox is proposed. Concepts are adapted from related visual practices and tested on design prototypes, which arise from the author's extensive experience in designing work and learning spaces.

Secondly, this thesis outlines *presence design* as a transdisciplinary aesthetic practice and discusses the potential contribution of architects to a currently heterogeneous research field, which spans media space research, cognitive science, (tele)presence research, interaction design, ubiquitous computing, second-order cybernetics, and computer-supported collaborative work. In spite of such diversity, design and artistic practices are insufficiently represented in the field. This thesis argues that presence research and its discourse is characterised by sharp disciplinary boundaries and thereby identifies a conceptual gap: presence research typically fails to integrate aesthetic concepts that can be drawn from architecture and related visual practices. It is an important purpose of this thesis to synthesize such concepts into a coherent discourse.

Finally, the thesis argues that remote presence through the proposed synthesis of architectural and technical design creates a significantly expanded potential for knowledge sharing across time and space, with potential to expand the practice and theory of architecture itself. The author's design-led research shows that mediated spaces can provide sufficient audiovisual information about the remote space(s) and other person(s), allowing the subtleties of nonverbal communication to inform the interaction. Further, in designing for presence, certain spatial features have an effect on the user's ability to experience a mediated spatial extension, which in turn, facilitates mediated presence. These spatial features play an important role in the process through which trust is negotiated, and hence has an impact on knowledge sharing. Mediated presence cannot be ensured by design, but by acknowledging the role of spatial design in mediated spaces, the presence designer can monitor and, in effect, seek to reduce the 'friction' that otherwise may inhibit the experience of mediated presence. The notion of 'friction' is borrowed from a context of knowledge sharing in collaborative work practices. My expanded use of the term 'design friction' is used to identify spatial design features which, unaddressed, may be said to impose friction and thus inhibit and impact negatively on the experience of presence. A conceptual tool-box for presence design is proposed, consisting of the following design concepts: *mediated gaze, spatial montage, active spectatorship, mutual gaze, shared mediated space, offscreen space, lateral and peripheral awareness, framing and transparency*. With their origins in related visual practices these emerge from the evolution of the concept of presence across a range of visual cultures, illuminating the centrality of presence design in design practice, be it in the construction of virtual pictorial space in Renaissance art or the generative design experiments of prototypical presence designers, such as Cedric Price, Gordon Pask and numerous researchers at MIT Media Lab, Stanford Institute and Xerox PARC.

keywords

Architectural design and theory, presence design, presence research, mediated space, mediated presence, remote presence, mediated interaction, audiovisually extended architecture, media space, design friction, hybrid space, virtual space, (tele)presence, transdisciplinary, mutual gaze, mediated gaze, spatial montage, tertium quid, active spectatorship, shared mediated space, offscreen space, lateral and peripheral awareness, framing, transparency.

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This approach strengthened my architectural practice for many years. Most significantly, it led me in 2005 to explore how an architect's insights and practical skills might be applied to areas (and materials) beyond what would be conventionally considered architectural practice. Encouraged by KTH President Anders Flodström and Professor Nils Enlund, I led an interdisciplinary group of researchers and technicians, who shared the belief that video-mediated communications could promote innovative thinking in terms of a sustainable development, in a successful application for a ten-year research programme to the Swedish Governmental Agency for Innovation Systems (VINNOVA). Our proposed Centre of Excellence in Sustainable Communications also received funding from other interested parties, such as Ericsson, TeliaSonera, Bonnier Group, and the National Board of Housing, Building and Planning. This PhD accordingly could not have been completed without the financial support from VINNOVA, and I especially want to thank Mattias Lundberg, Erik Litborn, Per Eriksson, Ulf Blomqvist, Sven Gunnar Edlund, Björn Österlind, Pernilla Rydmark and the appointed group of international reviewers in 2006, for believing in our original proposal. Having headed the application process, comprising 20 researchers from different fields of research, I was appointed Centre Director and given responsibility for the development of the centre over the subsequent two years. These efforts would not have been successful without the support of the KTH university management, and I am humbled by the close interest that Faculty Dean Folke Snickars, Vice President Gunnar Landgren and University Director Anders Lundgren have taken in our team's ambitions. I also want to thank Björn Hårsman, Dean of the School of Architecture and the Built Environment, for his sincere and well-intentioned advice during our many conversations. Thanks are also due to Ingrid Melinder, Dean of the School of Computer Science and Communications.

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now spanned more than ten years. To a large extent, it is the mediated dialogic interaction amongst us, as presence designers in prototyping experiments and research, which forms the basis of my reflections in this thesis. In our current laboratory for presence design, a decommissioned nuclear reactor hall (KTH R1 Experimental Performance Space), Leif and I continue to develop ideas that originated in the Centre for Sustainable Communications, by applying them to contexts relating to cultural heritage and museum practices. Having received funding from the Swedish Cultural Heritage Board since 2006, we collaborate with archaeologists Katherine Hauptman Wahlgren and Fredrik Svanberg at the Museum of National Antiquities in Stockholm. Our 'Mediated Museum' research group has proven a fruitful combination of research skills. For their generous interest in ways that presence design may inform museum practices, I also want to thank Sophie Nyman, Head of Exhibitions and Lars Amréus, Museum Director. For insightful contributions to our long-term collaboration with the National Museum of Science and Technology, Stockholm, I want to thank Jan Garnert, Lars Paulsson, Anne-Louise Kemdahl, Mariana Back, and Museum Director Ann Follin.

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In the ten years that I reflect upon in this thesis, a range of architects and students have contributed to the work carried out in my architectural practice, and many research colleagues and students in media technology have contributed to our experimental prototyping in presence design. I have, to the best of my ability, sought to acknowledge all who were involved in the design. Many others have contributed and I thank you all. Unless otherwise noted, all photographs of the design prototypes are taken by me or another member of each project group. All sketches and work drawings are my own or produced within my architectural practice: Intangible Design AB (2010–); Gullström Architects AB (2001–2007); Gullström & Westerberg Arkitektkontor AB (1993–2001).

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KTH, August 2010

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chapter 1 introduction

1

Hic et nunc: the Presence Chamber.

> The same. The Presence chamber.
> Enter KING HENRY V, GLOUCESTER, BEDFORD, EXETER, WARWICK, WESTMORELAND, and Attendants
> KING HENRY V: Where is my gracious Lord of Canterbury?
> EXETER: Not here in presence. (William Shakespeare's *The Life of King Henry V*, i. 2)

The Oxford English Dictionary (OED) provides a meaning of the term *presence* which is now obsolete but offers an architectural reference of interest to this thesis. *Presence* formerly denoted a "place prepared for ceremonial presence or attendance; a presence chamber". This is how we are expected to interpret the excerpt taken from William Shakespeare's *The Life of King Henry V*, above. It may surprise a contemporary reader that the statement "Not here in presence" is an abbreviation of "Not here in the presence chamber", since the meaning of the term has changed over time. A similar, yet more explicit example is found in Shakespeare's phrasing in Henry VIII: "An't please your grace, the two great cardinals wait in the presence." (Shakespeare 1613: iii. 1)

A reversed order of the words, as in *chamber of presence* was also common. Such a phrasing was used in a letter from the Earl of Bedford who wrote in 1565: "David [Rizzio] was thruste owte of the Cabinet thorowe the bede chamber into the Chamber of Presens."[1]

Although *to be present* still suggests that someone is nearby and *at hand*, visible to one's eye and somehow within a certain proximity, the spatial reference today is vague and ambiguous in comparison. Today, the term presence seems more commonly treated as an opposite to absence, which lacks a spatial reference altogether. If a person is not here – s/he could be just anywhere! It is assumed that someone may be either present or absent. The Latin phrase 'hic et nunc' (here and now) comes to mind as we address the underlying expectations of *presence*. How near a person must be, and exactly where, for us to declare his or her presence we cannot say. If, for example, one states "She is present, I know, because I saw her in the reception area earlier this morning", the term's use has been broadened, suggesting that to be present it suffices that the person has entered the premises or checked in to work today. We may still not know, however, where the person is. It is, consequently, impossible to say how close someone has to be; to define the prerequisites which allow us to assert that someone is present unless we add a precise location (e.g. behind that desk, at the far end of the reading room). She may not be *here* – yet sufficiently *near.*

1. *The Queen's Presence Chamber at Windsor Castle, painting by Charles Wild, 1817. A Presence Chamber may be described as a space in which a sovereign or other great personage received guests, or persons entitled to appear before him; a reception-room in a palace or great house. (Wild 1817)*

[1] OED refers to Ellis original Letters, Ser. 1. II. 210.

REMOTE PRESENCE

This study arises from the need to address *mediated spaces* and what *designing for presence* implies for the discipline of architecture. It argues that remote presence is a concern for architects. It is also a contribution to presence research in that it observes the combination of spatial and technical design necessary to support *mediated interaction.*

As a practicing architect for twenty years, I have primarily designed office buildings and workplaces, but also restaurants, pool houses, private homes and furniture. Like most architects, I have thrived in the unexpected challenges and learning situations that every new commission has brought; a reason, I believe, why so few architects choose to specialise. Each commission differs from its predecessor, and to address each challenge, my office adopted a participatory design methodology as a means of genuinely understanding and representing every new client's needs.

Reflecting on my own design practice, the commissions during the first ten years differ in one significant way from the ones that I later engaged in: They always resulted in *tangible* design artefacts; buildings, interiors, furniture pieces, etc., developed to support human interaction of some kind. Over the past ten years, however, I have designed architectural extensions in which traditional building materials are replaced by a new kind of architectural element, defined by video camera lenses, projectors, and displays. This book is about my experience, stretching over ten years, from designing such *mediated* spaces – it is about *presence design.*

As an architect, I was immediately struck by the possibilities and challenges, not least in terms of sustainable development: if people can remain where they are, yet collaborate sufficiently well, the need for travel, commuting, as well as the planning of urban infrastructure and new heated buildings, can be renegotiated.[2] I was curious to understand how the architectural profession would be affected by the implicit extension of practice that mediated spaces would entail. In my view, architects were on a threshold, about to face a thorough reformulation of their practice, empowered by the connectivity of the new network society, such as that articulated by Manuel Castells (2000; 2004; Castells et al. 2007).

I expected a complete transformation of workplace design. In 2001, while designing mediated meeting rooms for a Swedish telecom firm, which extended from their headquarters in one country to their work groups in another, I envisioned a set of very elaborate architectural extensions: remodelled offices that would enable teams to collaborate closely, as well as socialize, regardless if people were at home, at the office or anywhere else.[3] Although several experimental designs that create mediated architectural extensions exist, the paradigm shift of the network society appears to have had limited impact on workplace design or our ability to create spatial extensions. How could this be? Were architects not interested in these new 'building materials'? Surely, the impact of digitalization must trigger a parallel change in architectural design.

Meanwhile, my media technology colleagues and I were developing prototypes for a number of research and design projects, frequently involving students to help us improve our designs. Along the way, we slowly realized the many complexities involved in creating seamless spatial extensions. We designed spaces in which everyone was *present*, but where, *really,* people would be geographically separated, either in different parts of a building or by thousands of kilometres. Little by little, we mastered the different challenges involved in extending spaces to remote locations. We repeatedly improved our designs by seeking to

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[2] The VINNOVA Centre of Excellence for Sustainable Communications at the Royal Institute of Technology (KTH) in Stockholm was founded in 2005 with the vision that innovative applications of media and communication services can support sustainable development. I led the work to establish the interdisciplinary research centre with long-term funding from partners in Swedish industry and society, in the role as its scientific director 2006-2007, and was subsequently responsible for the 'Mediated Spaces' project 2007-2009.

[3] I later refer to this project as *the three halves*: meeting rooms in Stockholm, London and Reston, US, for Telia International Carrier, see illustration 24 and Appendix 2: 'List of Projects that Informed my Research'.

facilitate *mutual gaze*, the perceived feeling of having direct eye contact, between participants, ensuring that our mediated windows, walls and spaces were well integrated with the overall interior design, providing a spatial extension that naturally included remote participants in their local environment. Realizing the major challenges in capturing, transmitting and representing a remote location, we also experimented with lighting, colour schemes and acoustics to achieve an integrated design and that minimized any visual or acoustic gap. Alternatively, we would emphasize the difference between locations by making their contrast explicit through design.

Most importantly, we worked with users to understand how each group would benefit from remote presence and what their expectations would be. Were they aiming to improve or alter the forms of communication? To reduce personal travel? Before introducing alternative approaches, we had to evaluate the current patterns of communication in the workplace. We would need to ask a lot of questions. What does the current interaction entail; formal meetings, collaborative work or informal socializing? How is this currently supported by the design of the workplace? How many people would be involved in the interactions and which facilities may be used? What kinds of equipment are used as part of the interaction? And so forth. The process would result in a design brief summarizing the users' expectations and defining needs and our team would develop proposals, inviting the users to test our prototypes along the way. With every new project we have strived to improve our designs. It was already clear from our first prototypes that participants experienced a sense of presence and that they could interact and collaborate professionally *almost as well* as they did in their conventional work environment. We were thus able to assert that our prototypes worked for the specific situations in which they were developed, but would need to be refined and further integrated with the work activities and overall architectural design to provide viable alternatives to generic meeting and travel patterns within a given organisation. In accordance with prior research in the field of presence research, we observed that a combination of factors determine an individual's experience of presence, some of which are related to the field of architectural design.

A large body of research has attempted to distinguish specific criteria for mediated presence.[4] One of the main contributors to presence research, Wijnand IJsselsteijn, proposes a presence theory which acknowledges that a spatial relationship is established when *mediated presence* occurs. This presence theory assumes that for presence to occur

> …[W]e first must direct our attention to the media environment at hand. Second, the environment itself needs to have spatial extent, putting requirements on its immersive qualities in terms of necessary depth cues, field-of-view, etc. Third, the ongoing construction of our sense of place is based on a limited number of 'reality tests'. If what is 'out there' responds in a fast, consistent and reliable way to our real-time sensorimotor probing – transforming appropriately as we move our heads and bodies, changing predictably as we interact with elements of the immersive environment –this will establish a basis for our perception of being part of the environment. (IJsselsteijn 2004: 165)

To explain why a mediated space which is "low on visual realism" can also enable an experience of presence, he points to the role of *active perception* on behalf of users, provided "our sense of place is continuously and reliably supported by robust, real-time sensorimotor correlations" (166).

What I draw from IJsselsteijn's research is that spatial design plays a significant role in the process through which presence and trust are established: the 'reality tests'. As part of negotiating trust and presence, a user will attempt to establish the spatial relationship

[4] I do not explore in detail the current research whose aim is to measure the experience of 'mediated presence'. To develop scientific measures has been a primary concern of the broad and interdisciplinary field of presence research, partly hosted by the International Society of Presence Research, which I discuss in a later section. To develop scientific presence measures is complex because it involves psychological processes. ISPR recognizes that "researchers face significant challenges in developing valid and reliable measures of presence" (ISPR 2009). Two general approaches, subjective and objective measures, have informed the 'ISPR Measures Statement and Compendium' (ISPR 2000).

between the space in which s/he finds herself (i.e. real space) and the remote spaces represented, e.g. on a wall (virtual space).

In summary, mediated presence involves the following functions:

(1) *Attention* on behalf of the remote participant who is about to experience mediated presence;

(2) The environment itself needs to have *spatial extent* and immersive qualities allowing a user to understand the remote location (depth cues, field of vision);

(3) An *ongoing construction of sense of place* has to be triggered;

(4) *Feedback* from the remote environment should be *swift, consistent* and *reliable* in response to real-time sensory motor probing.

A concluding remark from another study similarly points towards the relationship between presence research and architectural design:

> Experiencing presence requires the reproduction of the physical features of external reality; the possibility of interaction and free action, and the creation and sharing of the cultural web that makes meaningful – and therefore visible – both people and objects populating the environment. (IJsselsteijn & Riva 2003)

My own study is not needed to further confirm that a sense of presence can be achieved in mediated spaces, but rather to address *what* the contribution from architectural design entails, and *how* the combination of spatial and technical design that supports remote presence and mediated dialogic interaction may be refined, especially through integration and application to the contexts of work and learning.[5] As a *presence designer* I have sought to develop my skills and expertise by addressing new contexts and reflecting on my previous experience. This is a design-led research methodology that I will present more closely in Chapter 2: 'Research themes and methodology'.

In this section, I recall my initial struggle to describe mediated spaces and also my early detection of a fair amount of scepticism among fellow architects. Using the concepts provided by architecture's professional discourse it was not easy to express myself clearly. What did I mean by a mediated space? How can it be a space if you can't walk into it? However, when I demonstrated a mediated space and enabled participants to experience remote presence personally, my colleagues immediately interpreted it as an architectural, spatial extension. So why was it so difficult to find suitable terms? This person, with whom we were now interacting, was she virtual*?* No, she was quite real, although she was in a remote setting, convincingly connected to the one we were sitting in. So, she was obviously *there*, but at the same time, in a way, *here* – sufficiently 'near' for us to experience her presence. Where my friends first may have thought of 'screens', 'monitors' or 'video-walls' they agreed with me that it was more adequate to speak of an opening in a wall, a door or a window.

In effect, I had identified a conceptual gap, which I was quite keen to explore further by writing about my experiences. What were mediated spaces, really? Were they possible to incorporate into architectural practice and discourse? Had I encountered a design field that had fallen right between traditional disciplinary boundaries? I asked myself how mediated spaces could be represented in work drawings and implemented to the procedures of architectural design. This would require that the needs for *remote presence* were defined as part of a design brief. I would also need to identify the stages in the design process in which media and communications consultants ought to be involved. My previous experience was that architects often left a blank in work drawings, and merely allocated an empty space for activities which involved media and communications technology. Such responsibilities would

[5] I use the concept of *dialogic interaction* with reference to Mikhail Bakhtin (1984) who regarded *dialogism* as a basic principle on which all essential human interaction is based. In Chapter 4, 'Sharing Knowledge Sharing Spaces', I elaborate on how, for Bakhtin, ideas develop through dialogic relationships with language as a tool.

be handed over to a company, which only after a building was almost complete, would be fitted out with technical equipment according to specification, with little relation to the architectural design brief.

Some friends from architecture had argued: "This is not architecture! It is media technology! Architects, by tradition, design real spaces using real materials." What are the unstated boundaries of the architectural profession, I wondered, and why the need to distinguish between 'mine' and 'yours', 'architecture', 'design', or 'technology' in the first place? Surely, I reflected, such boundaries had dissolved. It suffices to agree with Herbert Simon's claim that we live in a world of artificial artefacts designed by humans (1968); with Donna Haraway's argument that new technologies have become inseparable from our bodily identities (1991); or with Manuel Castells that social change requires the ability to shape the human mind, the most fundamental form of power (2009: 3).

Society currently faces increasingly complex challenges and we need to facilitate sustainable patterns of behaviour, accepting (with Haraway) that the boundaries between the natural and the technological have been erased. In our society of ubiquitous computing, technology has encroached into how we 'enact being alive' (ibid.). Viable communication solutions require creative and innovative thinking on several levels, not the least of which is an ethical concern relating to our new 'cyborg identity', where we are expected to navigate between natural and a range of mediated presence(s), as currently designed by presence technologies, transaction technologies, social network technologies, surveillance and identification technologies, etc. [6] As noted by IJsselsteijn: "In the entertainment industry, the creative people behind non-interactive presence-evoking environments are well aware of the strengths and limitations of their trade, and make excellent use of coherent, seamless, narrative structuring, engaging our cognitive constructive processes to their fullest." (2004: 166)

Limiting the exploration to collaborative practices where dialogic interaction and learning are central concerns, my own objective is to further explore the relationship between the field described above and architectural design, using my own design experience and observations from both fields.

From the above it is clear that a large body of research informs the design of mediated spaces and is concerned with the concept of *presence.* An often-cited definition of (*tele)presence* establishes a reference to architectural design: "The use of technology to establish a sense of shared *presence* or shared *space* among geographically separated members of a group" (Buxton 1992).[7] A fairly recent field of research, *presence research,* is, however, primarily formulated from the perspectives of cognitive science and communication technology.[8] Studies in human cognition and perception have advanced the understanding of presence as an individual experience and perceptual illusion (Lombard & Ditton 1997; Held & Durlach 1992) and as a 'product of the mind', regardless of the technology at hand (IJsselsteijn & Riva 2003). Presence research is currently a diversified field, spanning media space research, cognitive science, (tele)presence research, interaction design, ubiquitous computing, second-

[6] Cf. IJsselsteijn & Riva (2003) who use the following terms to distinguish between different kinds of presence that media can generate: (1) *Physical Presence* is triggered when one is immersed in Virtual Reality, Location Based Entertainment, Cinema, Painting or Television; (2) *Co–presence* occurs when one is engaged in interaction through Shared Virtual Environments, video conferencing of video phoning; (3) *Social presence* occurs when people communicate via email, telephone, letters, online chats or Multi–User Dungeons.

[7] It can be argued that all architecture, similarly involves a 'use of technology', why Buxton's definition would benefit from a demarcation, such as 'the use of communication technology'.

[8] Although many academic publications exist, relatively few books have been published. A seminal article from 1997 by Matthew Lombard and Theresa Ditton (Temple University, USA) entitled 'At the Heart of it All: The Concept of Presence', provides an important conceptual framework by summarizing the contribution from researchers from a variety of disciplines (e.g. cognitive science, neurology, virtual reality, computer graphics) (Lombard & Ditton 1997). A co-founder of the International Society of Presence Research (ISPR) its current President, Matthew Lombard, is a prominent figure in presence research, notably through the annual organisation of an international conference since 1998 (PRESENCE). He was on the editorial board 2000-2006 of the MIT Press journal 'PRESENCE: Teleoperators and Virtual Environments', which published the online-supplement 'Presence-Connect'.

order cybernetics, and computer-supported collaborative work. With the proposal that its discourse is characterized by the separations of disciplinary boundaries, and that architecture, design and artistic practices are insufficiently represented, I discuss the potential for a further transdisciplinary and design-led approach where presence research meets architectural design, and where spatial and aesthetic conceptual tools, derived from related visual practices, may apply. This is the background to the chosen title of my design-led exploration where I establish presence design as a distinct area of research that bridges presence research and architectural design.

While my focus is on the spaces in which mediated interaction occurs – the mediated spaces of presence design – Caroline Nevejan has addressed presence design with a specific focus on the concept of *trust* (2007). She makes a distinction between *natural presence* and *mediated presence*, to explore the role trust plays in mediated social interaction. As a phenomenon, natural presence can be defined by our bodily condition as a living human being, present at a certain moment in a certain place. While the impact of our actions can extend beyond this time and place, an action always takes its starting-point where the body is located in a specific time. With the Universal Declaration of Humans Rights (as adopted by the UN General Assembly on 10 December 1948) as a normative marker, Nevejan explores how presence design can respect human dignity as formulated in this document. Her doctoral thesis, entitled 'Presence and the Design of Trust', argues that human rights – formulated to influence how people perceive and behave towards each other – must be respected also in situations of mediated presence, thus having a direct applicability to presence design practices (ibid.).

Nevejan further distinguishes between *presence* and *witnessed presence* by establishing that in judicial systems, this is part of the negotiation through which people establish *trust* and *truth*. Nevejan notes that the definitions of time, place and action have a different meaning in civil law, compared to criminal law, where presence becomes a crucial factor in establishing whether a fact occurred or not. A crime becomes a deed the moment it is witnessed. She illustrates this by how questions in court are formulated: "Was the accused present at the time and place of the crime and/or did his/her actions trigger the events? Is there another person who can testify that he/she was somewhere else? Do other witness reports and supporting materials like traces support this, for example?" (ibid.: 81) She asserts that presence is one of the primary mechanisms that people use to establish trust and truth and that the design of presence consequently has a profound influence on the way we trust and how trust is negotiated (ibid.: 23). She does not elaborate at depth on trust, yet establishes the connection between presence and trust. Thus qualifying *mediated presence* with the addition of *(witnessed) mediated presence*, her study is a valuable contribution to presence research in that it relates the design of presence to the design of trust in mediated social interaction.

Referring, again, to the conceptual gap I have identified on the basis of my personal experience from interdisciplinary design and research projects, there is not yet a shared discourse in *presence design*. In spite of our well-composed research groups, representing different technical skills (e.g. architecture, media technology, acoustic engineering, transmission technology, programming, broadcasting, geometric optics, etc.), as well as other expertise from social anthropology, ethnology and psychology, we have often experienced difficulties due to a lack of shared vocabulary. Although architects and engineers are quite similar in terms of how we use prototyping and modelling in design and innovation, our work and research methodologies differ, as does the way we, to quote Wittgenstein, 'play our language games' (1953: 166ff).

The conceptual gap is illustrated by the many different uses of vocabulary, for example to describe the experience of *remote* or *mediated* presence. I will use the term *remote presence* to describe the experience of presence, as designed and mediated through video and media technology. In turn, I use *mediated spaces* to specifically address the design context which precedes the individual experience of presence, and its relation to architectural design, my own practice.

Each contributor to a project will describe the work performed quite differently and according to our respective research focus or professional skill. Where some observe minute technical details in synchronizing mediated spaces (for example, stressing the need to diminish delays in audiovisual transmission), others excel in innovative ideas that enable mutual gaze in mediated interaction, or in the fusion of spatial and technical design that allows the interpretation of an 'architectural extension'. All these are technical skills required in presence design, and if not of equal importance, they are needed to secure the design that enables participants to experience a sense of presence. As designers, we cannot ensure the experience of presence, but our focus is on the context in which a sense of presence takes shape. Nevertheless, our work can be described in a variety of ways. Let me illustrate my own disciplinary bias by quoting my own description above, which describes the challenges we tried to overcome in presence design. I wrote - and this thesis is arguably written - from the perspective of an architect:

> We repeatedly improved our designs by seeking to facilitate mutual gaze between participants, ensuring that our mediated windows, walls and spaces were well integrated with the overall interior design, providing a spatial extension that naturally included remote participants in their local environment.

This could also have been formulated in many other ways, for example by making the integration with spatial design less explicit and stressing the purely technical prerequisites for mediated interaction.

I have found there are many reasons to compare the interdisciplinary collaboration which characterizes a building design process with the emerging field of presence design that I discuss here. As is the case in any complex building process, architects and engineers work together and many other skills contribute throughout an extensive design and construction process. A crucial difference, however, is the common ground which has evolved over many years (even centuries) to establish an effective dialogue through extensive building design processes. A shared discourse among all parties involved is necessary to ensure quality and that nothing is lost throughout the many phases of a building design project. What is characteristic of presence design and mediated spaces is precisely that it is new. From this it follows that architects generally know quite little about media and communications. In turn, media technology is a relatively new professional field with a wide area of applications, but without much relation to spatial design. Hence today's lack of a shared conceptual discourse in presence design, a lack of terminology that would enable the control of, for example, quality.

My aim here is to contribute to such conceptual development. I have therefore given some thought on how to compose this thesis, considering that I address two audiences who know little about each other. This is, for example, why I have provided you with this background and why this thesis includes perspectives from several different disciplines in the field.

WHY DO PEOPLE MEET?

As this study will show, mediated spaces are not new. With examples from early visual practices I demonstrate how people, over many centuries, have become accustomed to virtual and mediated spaces that establish architectural extensions for work, learning and leisure. This history of presence design emanates from a broad range of practitioners – architects, artists, writers and filmmakers – who have contributed hybrid design artefacts through the juxtaposition of real space and virtual space: mediated spaces.

What is new today is that it has become possible to populate these architectural extensions, to inhabit them in ways that allow people to interact and collaborate closely, to see and hear each other and to be present before one another, whilst remaining in different locations. A contemporary definition of presence design is thus a *shared mediated space*; one that allows people to collaborate as well as they can, for example, in their conventional workplace, possibly designed by architects.

Architectural design is conventionally executed by 'brick and mortar', but new building materials are developing everyday, some adapted from the fields of media and communication. Delimiting the current study to my own design practice, which has explored video as a 'building material' and design component over ten years, this thesis focuses on the design issues that enable people to meet, collaborate and interact in shared mediated spaces in real time: presence design.

This thesis provides an architectural perspective on presence design, exploring its potential to create architectural extensions that facilitate knowledge-sharing and remote presence. My aim is to explore presence design as a means by which architects can facilitate meetings and interactions.[9]

What compels people to seek a face-to-face encounter? People meet to see, hear, supervise, collaborate and interact with other people in different contexts. Depending on the underlying expectations of *co-presence* in a specific context, it may be considered a good solution to gather people in the same space at the same time, for example to synchronously perform a task or to lecture or inform a large group. At other times, however, a viable solution may be to podcast a lecture or to organize work in such a way that individuals can access information or perform tasks at a later time, possibly in different spaces and independently of one another. In other words, co-presence is not always required.

In relating the needs for presence to spatial and temporal design, it is necessary to discern between different functions and expectations of meetings and interactions.

We may ask whether it is primarily by convention that we commute to work, or whether human co-presence is an actual prerequisite for the professional work performed. While it can be argued that most relationships benefit from physical contact between humans (e.g. the need to momentarily touch someone's arm, or to shake hands) most work-related collaborations do not rely on physical contact as much as they rely on the potential exchange of knowledge, information transfer, direct access to expertise and flow of ideas between individuals. These are knowledge management processes in which the concept of trust is a qualifying factor. In effect, trust and presence are closely linked.

I propose that a presence-in-person paradigm prevails in our society, founded on the expectations of achieving trust and sharing knowledge between individuals. Sustaining this paradigm, particularly within work and learning contexts, I suggest a design convention has

[9] Motivated by a lack in the existing literature on the field, my specific focus on architectural design deliberately avoids detailed descriptions of the many technical components required for the capture, transmission and representation of a remote location. However, I wish to acknowledge the complexities in assembling, engineering and monitoring the communications systems as a prerequisite of presence design and I refer to complementary sources throughout the book. In comparing the technical expertise of an architect with that of a media technology engineer, certain common ground can be noted while many areas of expertise are different. The interdisciplinary projects which I refer to here can therefore be characterized as an extensive learning process for all parties involved.

developed in which meetings and interactions are achieved by means of gathering people in one geographic location at the same time. My study therefore addresses the contribution of presence design to architectural practice, as well as the reciprocal contribution from architecture to presence design, given that mediated spaces - specifically synchronous audiovisual spatial extensions using video and media technology as design components - currently provide viable alternatives for meetings and interactions, and that such spaces have an effect on workplace design.

Throughout the thesis, I will therefore explore the foundations for the *presence-in-person paradigm*, arguing that, in line with the emerging network society, presence is currently renegotiated, which has implications for both architectural practice and theory. One may say that I explore the relationship between presence design and architecture, with a particular interest in the implications for professional work and learning contexts where dialogic interaction and close collaboration is crucial. This design-led research can be regarded as an exploratory study founded on my reflective practice, first as architectural designer (1990-2005) specialised in workplace design, and second as presence designer (2000-2010). It thus summarizes work carried out over a long period of time during which an iterative research-by-design process developed through the combination of experience though practice and the theoretical and analytical tools of a reflective practitioner.

To address knowledge management as a spatial and temporal design issue assumes a correlation between spatial organization and human interaction, which is a long-standing debate, not least within architectural theory. There is, for example, no scientific evidence that an open plan layout stimulates more interaction than a cell-office layout (Steen 2009). Space syntax theory has, however, to an extent shown that spatial features such as *proximity, visibility* and *layout* stimulate interaction and collaboration (Hillier 1996; Allen 1977; Nonaka & Konno 1998; Sailer 2010).

My study is equally informed by research that has determined factors that may contribute to *poorer synchronizing* (Argyle & Cook 1976) and *frictions* (Davenport & Prusak 1998), which may inhibit knowledge sharing in collaborative co-present contexts. Unless, for example, mutual gaze and trust can be established as part of dialogic interaction, the subtleties of nonverbal communication are easily lost.[10] I address this in Chapter 4: 'Sharing Knowledge Sharing Spaces'.[11] Trust is a core element in the body of 'informal and tacit practices' which sustain knowledge-sharing in accordance with Polanyi's notion of tacit knowing (1958; 1966) and Wittgenstein's concepts of *rule-following* and *collectively established meaning* (1953). A large body of existing research around dialogue, skill and tacit knowledge (Janik 1994; Johannessen 2004; Nordenstam 2007; Göranzon et al. 2006) may thus be applied to presence design.

Based on a distinction between natural presence and (witnessed) mediated presence, Nevejan (2007) relates the design of presence to the design of trust in social interaction. Arguing that there are social implications, which designers are little aware of, concerning the way trust and truth are negotiated between people, she stresses the need for swift feedback mechanisms (to provide an expected 're-action' to an action) in designing for social interaction (ibid.: 252). Her study shows that mediated presence may increase the moral distance between actors who collaborate due to the limited sensorial exchange, and thus has the potential to negatively affect trust.

Nevejan proposes a conceptual framework for the new configurations of time, space, action and relation that is enabled through presence design and no longer dictated by

[10] Achieving mutual gaze has been observed as a key element in establishing trust, also in mediated interaction (Heath & Luff 1992; Heath et al. 1995; Rocco 1998; Acker & Levitt 1987; Ishii & Kobayashi 1992; Fullwood 2006). Trust is established as a prerequisite to the individual experience of presence in mediated environments, contributing a 'sense of being there' or of 'non-mediation' (Ijssellsteijn & Riva 2003; Lombard & Ditton 1997; Held & Durlach 1992).

[11] Although I recognize that 'friction' triggered by, for example, cultural misunderstanding may fruitfully benefit interdisciplinary collaboration, my study is delimited to the factors relating to trust-building that Davenport & Prusak raise. Amongst these, the lack of common ground, lack of time and lack of meeting place are noteworthy in terms of the spatial issues that I address.

'physical presence'. She refers to this as the YUTPA framework where YUTPA is an acronym for 'being with You in Unity of Time, Place and Action' (Nevejan 2009). The word Unity here refers to a specific configuration between four dimensions that a certain product or process design imposes on the user, and which favours certain interactions while excluding others.[12]

My own design-led research shows that mediated spaces can provide sufficient audiovisual information about the remote space(s) and person(s), allowing the subtleties of nonverbal communication to inform the interaction. These are observations founded in practice, based on my personal experience of designing for presence over many years. Here I need to establish as *a priori* knowledge that at the outset of my research from 1999 to 2002, the first design prototypes confirmed that our mediated spaces, windows and walls already provided adequate spatial extensions, allowing the subtleties of nonverbal communication to inform interaction. As designers contributing to these processes, we were able to unanimously assert: it works, but this and that could be improved. We would then move on to make adjustments, following the generic prototyping methodologies that characterize design practices following Herbert Simon (1967) as well as Donald Schön's concept of a *reflective practitioner* (1983).[13]

Our designer observations comply with the general requirements for mediated presence that Wijnand IJsselsteijn presented in his doctoral dissertation, to which I referred above (2004: 165). In this study it is my concern to substantiate such observations that explicitly relate to architectural design, not through further claims that mediated spaces can work, but rather by showing how the specific design issues IJsselsteijn raises have been treated, or at least addressed, in related visual practices throughout the history of presence design. As such, my study should be seen as a contribution to presence design research. IJsselsteijn and other cognitive scientists within presence research have developed a deep understanding of how mediated presence affects interaction, and are committed to the development of scientific presence measures. In contrast, my own approach is design-driven.

To elaborate on my dual role as designer and researcher: as designers, my colleagues and I have explored the potential of presence design over the years, by refining 'what works', by developing design prototypes and applying them to new contexts. One could say that in each new project, we 'tick off' criteria such as those proposed by IJsselsteijn, to check that it still 'works'. However, our focus is on refining the combination of spatial and technical design that facilitates mediated interaction. Therefore, several of the design concepts I discuss here are based on a solution that enabled mutual gaze in mediated interaction, which already 'worked' ten years ago, but which we improved over the years.

As a researcher, in turn, I reflect upon the different design experiences and use them as examples in an explorative study concerning the wider implications of presence design in relation to architectural design. With the *a priori* knowledge that mediated spaces can serve knowledge sharing, I explore its potential for practices where trust is an essential factor. This is, for example, the case in a number of collaborative work and learning practices, where practical knowledge is at the core of an exchange. Thus, by establishing that mediated workplaces can support knowledge-sharing as effectively as real (or natural) co-present workplaces, I propose an extension of the discourse in workplace design. I discuss how

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[12] Nevejan writes that specific configurations enable human beings to "enact their being, witness each other, tune and perform their presences". The four dimensions that allow different configurations are described as follows: "(1) The You/not-You dimension refers to the relationship with the other human being(s) with whom one interacts; (2) The Now/not-Now dimension refers to the sharing of the experience of time, synchronous or asynchronous in past or future; (3) The Here/not-Here dimension encompasses the sharing of place or not. Depending on how place is defined or experienced this can be geographically small or large, it can also refer to the sense of distance in virtual and online worlds; (4) The Do/not-Do dimension refers to the possibility to act as part of or as a result of a social interaction." (2009)

[13] How can an architect assert that a space or a design works? I elaborate on this issue of aesthetic judgment and professional skill (as founded on reflective practice) in my method section. I have also addressed this in my earlier research related to knowledge-sharing and professional skill in architectural discourse (Gullström 1994, in Swedish).

presence design can contribute viable solutions to knowledge management. Central here are the concepts of shared mediated space, established as part of the experience of remote presence and found in the exchange of audiovisual information, as well as the prerequisites for qualified knowledge sharing. I found that in designing for presence, certain spatial features have an effect on the user's ability to experience a mediated *spatial extension* (or sense of a shared mediated space), which can in turn facilitate the experience of mediated presence.

The question, 'What compels people to meet face-to-face?' can now, at least in part, be answered: people need to meet if the expected interaction requires physical contact, which only natural presence in real space can provide. People are also compelled to meet if qualified knowledge-sharing is expected from the interaction, in which case mediated spaces can be used – provided they enable sufficient audiovisual exchange for (witnessed) mediated presence (Nevejan 2007; IJsselsteijn 2004).

Keeping in mind that *to meet* no longer automatically implies an interaction limited to one specific time and place, we may reformulate the question as a spatio-temporal design problem of 'How might people meet?'

As is always the case in design, there are many possible solutions to a problem. In the following six design examples, we will look more closely at this practice of *designing for presence*.

SIX DESIGN EXAMPLES

A sequence of design examples forms the backbone of my research. I have selected these because they illustrate particularly well what presence design once was – this is the case with *da Vinci's Last Supper*– or because they show what presence design can be, such as the case of *Atwood in Norway*, designed by my colleague Claus Aase Schibsted Knudsen. The remaining four examples are my personal design experiences from what can be described as a long prototyping process that spanned ten years. These are taken from interdisciplinary research projects to which I contributed as an architectural designer and researcher.[14] It has not been my aim to provide a full account of these research projects, each representing an extensive interdisciplinary project more than two years in length. Rather, I focus on their similarities and differences, as perceived from my perspective as an architect and presence designer. I have therefore selected specific design experiences from these projects that help to structure the arguments raised as part of my thesis. The six examples are named as follows:

da vinci's last supper 1498

a mediated therapist 2008

mediated unemployment services 2005

remote affinity in the archipelago 2004

the mediated museum 2008

atwood in norway 2008

I will introduce the design examples below, each pointing to a specific section of the thesis. With the exceptions of *da Vinci's Last Supper* and *Atwood in Norway,* the design examples are taken from my own practice. All examples are described in dedicated sections preceding Chapters 3 to 7.

The example of *da Vinci's Last Supper* introduces Chapter 3: 'The origins of presence design', where I introduce the concepts of mediated gaze in virtual pictorial space, with examples from related visual practices.

In turn, *A Mediated Therapist, Mediated Unemployment Services* and *Remote Affinity in the Archipelago*, are three examples of mediated workplaces to which I have contributed as an architect, presence designer and researcher. In Chapter 4: 'Sharing knowledge Sharing spaces', I explore the presence-in-person paradigm in workplace design and discuss the expectations of knowledge sharing in relation to mediated work and learning environments. This is followed by a discussion of *mutual gaze* as an important feature in the design of mediated spaces (Chapter 5: 'Gaze and mutual gaze').

My design example of *The Mediated Museum* is a pointer to Chapter 6: 'Mediated windows, framing and transparency', where I reflect on my experience of designing mediated architectural extensions.

Finally, I use *Atwood in Norway* as an example of another designer's well-executed presence design. I carry out a limited spatial analysis using the conceptual tools I have developed for presence designers, which are discussed in Chapter 7: 'Spatial montage and spectatorship' and summarized in Chapter 8: 'Assembling the conceptual toolbox of presence design'. Additional examples that are pertinent to this thesis have been placed in Appendix 1: 'Further design examples'. Here, I employ the concepts of *spatial montage* and *active spectatorship* to reflect on the following examples: *A Mediated Control Room*, *A Mediated Pub*, *Mediated Mingling Between Two Conferences*. I also discuss four examples carried out by others: *A Mediated Music Masterclass*; *Two Mediated Dissertation Defences*; and the *Point 25 Mediated Performance Venue*.

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[14] The examples are based on design-driven research at the Royal Institute of Technology, combined skill sets in architecture, media technology, TV broadcasting, stage design and anthropology, among others. For details regarding these interdisciplinary projects and my role, see Appendix 2.

In my closing chapter (Chapter 8) I assemble 'the conceptual toolbox of presence design', by compiling aesthetic concepts that I consider useful and selected from my personal design experiences through the process of design-led research: *mediated gaze, spatial montage, active spectatorship, mutual gaze, shared mediated space, offscreen space, lateral and peripheral awareness, framing and transparency*. While these aesthetic concepts are put forward and discussed in different sections of the thesis, I then comment on their relevance to presence design and to an extended discourse in workplace design by applying them to what I call *design frictions*. Introduced in Chapter 4, this label allows me to approach the subject of an extended discourse in architecture. In summing up my own design experiences, informed by the tools of history and theory of presence design in related visual practices, as well as my observations of other designers' work, I return to the notion of an extended architectural discourse. I refer to architects as standing on a threshold, asking, with reference to Lev Manovich (2001), whether designers must strive towards a seamless extension of space – 'must all borders be erased?'– or whether other approaches might also apply.

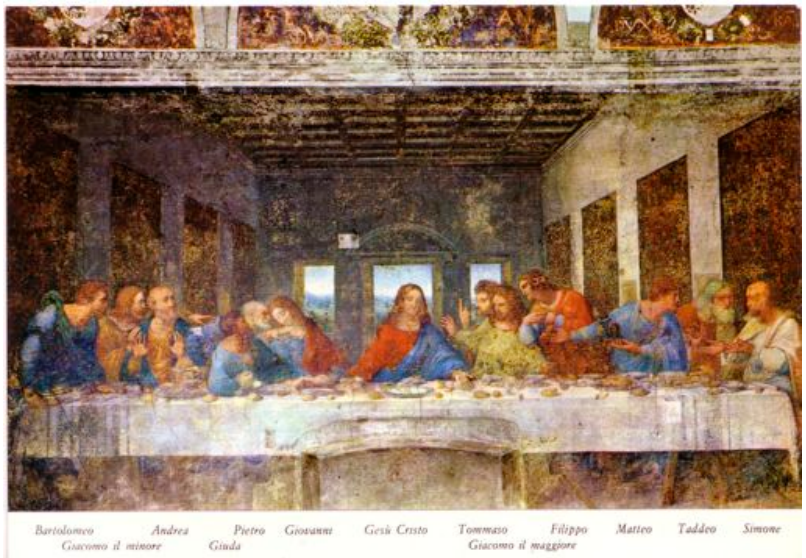
One reflection concerns architectural discourse itself, which I suggest may constitute a design friction of its own accord. Having observed the development of workplace design in relation to the emergence of the network society, little appears to have had an effect on architectural design relating to work and learning practices. I discuss this in terms of 'a complex relationship to materiality and immateriality' within architectural practice and discourse aiming to explain a resistance towards including virtual and mediated spaces in the realm of architecture and spatial design (or, Wittgenstein's terms, *seeing* mediated spaces *as* architecture). Such a resistance may be considered a paradox, in terms of my proposal that architects and artists already were at one time presence designers (Chapter 3).

I discuss such 'resistance' in relation to an 'empiricist stronghold' on architecture as a discipline, and propose an alternative approach (in view of an extended discipline), by considering the possibilities provided, for example, by generative design strategies. Repeating the argument (from Chapter 3) that these design strategies are already well in place, since they have been used before and are incorporated to related visual practices, I suggest there is no reason to linger: the conceptual toolbox for presence design is fully equipped and thus available for architects seeking to (re)engage in the design of mediated spaces. The final section of the thesis includes my reflections and proposals for future research on this subject, asking: who are the presence designers, if not the architects? My suggestion here is not that architects, by ourselves, engage in presence design, but rather that architectural practice incorporate mediated spaces and that presence design become a shared aesthetic practice involving diverse professional skills.

Having thus presented the main arguments of the thesis, I shall introduce my design examples in the following section.

da Vinci's Last Supper (1498)

Any art history book will describe da Vinci's Last Supper as an exemplar among the many depictions of similar motifs in Italian Renaissance art. Through its numerous reproductions, hung on walls or reprinted in books, contemporary observers are acquainted with the Last Supper as a painting, rather than a spatial extension. I use this as an example of ingenious interior design to show that in addition to being an architect, engineer and artist, Leonardo da Vinci was also a presence designer.



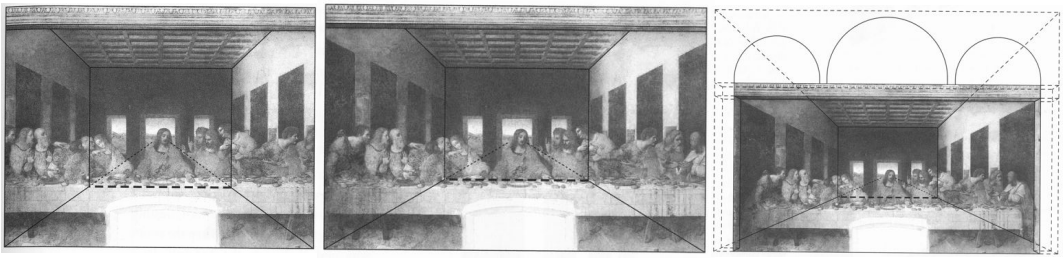
2. *'The Last Supper' by Leonardo da Vinci, depicting Jesus surrounded by his disciples. It has been debated whether the moment depicted in the painting is the institution of the sacrament – or the revelation of Judas' betrayal. (Postcard, Ed. L Scrocchi, Milano)*

How does a 15th century artwork relate to the topic of presence design today? According to the way this painting has usually been perceived by observers (facing a rectangular reproduction of the painting), the answer is, 'Not at all'. However, by observing The Last Supper as part of the spatial context in which it was conceived, we can make several important reflections. From a visit to the cloister of Santa Maria delle Grazie in Milan, a contemporary observer can begin to understand its original function. This is where we encounter da Vinci's *Last Supper*, applied in tempera on a wall of a large, empty room. An immediate reflection as one enters the room is that the perspective does not seem to work and that the painting is placed at a surprising height. Upon closer inspection, the table and several other features in the painting have the wrong proportions. Why does the mural not conform to the rules of central perspective, which were well established at this time? An analysis of the perspective will show that, in fact, it is only from 5.5 metres above ground and at a distance of approximately 8 metres that the illusion of a spatial extension is established.[15] To promote the illusion of vistas, viewed as if through an arch or a loggia, Renaissance artists frequently used architectural orders: columns and pilasters that established spatial extensions as "signposts to mark the transition from actual to virtual space" (Steinberg 2001: 155) – all in accordance with the Albertian concept of art as a 'window onto the world'.[16] Also here such a *framing border* is noticeable, but why would da Vinci choose a malfunctioning construction of perspective? This question has engaged art historians in a long-standing debate stretching over centuries (see fig. 2 to 4) but temporarily concluded in 1973 when Leo Steinberg, who with some authority, wrote: "Is there anything

[15] Danbolt (1979) quotes a Danish analysis of the perspective by Marcussen (1977). See also Nauman (1979) and Pedretti (1980).
[16] This concept is first described in Leon Battista Alberti's treatise on painting 'De Pictura' which appeared in Latin ca. 1435-36 (Alberti 1972: 55; cf. Alberti ca. 1435-36, 1970).

left to see? Is there anything left to say?"[17] However, an analysis published in 1979 by Gunnar Danbolt, a Norwegian art historian and critic, showed that art historians to date had failed to correctly interpret many crucial aspects of *The Last Supper* because they did not fully appreciate its role in the original setting (Danbolt 1979).[18] Danbolt was highly critical towards fellow art historians, who, he argued, had all analysed *The Last Supper* detached from its context "…as if it were a mere coincidence that Leonardo had painted within a refectory and as if da Vinci's hands were free when it came to executing the motif" (70).[19] The fact that the painting is a part of the design of a refectory provides the most important clue; it suggests that it is not just any painting or vista, not just any window onto the world.

3. The mural as we see it today when we enter the refectory of the cloister. It was completed in 1498 but already by 1517 damage was documented and the mural has since undergone several major renovations. It has been noted that several attempts to restore it over the following centuries caused further damaged. By chance, it survived World War II, while most of the walls surrounding it were completely destroyed. For a detailed account of the restoration, see Steinberg (2001), Ladwein (2007). (photo: Steinberg 2001)



4. Earlier attempts to analyze the pictorial space in relation to the refectory had failed. Steinberg illustrates the effect of locating the base of the rear wall too low (left); the effect of levelling the base of the rear wall with the far edge of the table (centre); the base of the rear wall at its only possible level (right). (2001: 165)

I will use this example to show, on a general level, that the monks were quite familiar with moving between different kinds of (virtual) space and, more specifically, that the refectory (including its artwork) is the result of an intent to combine virtual space(s) and real space(s) in intricate ways. In today's context we may refer to this as a 'virtual pictorial space', and as a form of communication made possible by means of art and architectural media. The monks are, symbolically, sharing the room – even dining – with Jesus who, however, is not physically present. The monks are inside a 'real space' when they encounter this 'virtual space'.[20] They are, thus, in a 'hybrid space', 'mixed-reality space', 'composite space' or, as I henceforth shall refer to it, the monks are in a 'shared mediated space'. Further, I have now introduced the notion of an architect – in this case Leonardo da Vinci – as a presence designer.

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[17] Steinberg has more recently (1995; 2001) provided an extensive summary, and to an extent revised his earlier analysis (1973). For a full account of the misconceptions regarding the perspective, see also Ladwein (2007).

[18] This case-study appears in Norwegian in 'Den Estetiske Praksis' (which translates as 'The Aesthetic Practice') co-edited by Gunnar Danbolt, Kjell S Johannesson and Tore Nordenstam. The latter two are philosophers at the University of Bergen, Norway and founders of what has been referred to as 'The Bergen School of Aesthetics' for their devoted application of Ludwig Wittgenstein's late philosophy to aesthetic practices (See e.g. Janik 1994; Johannessen 2004).

[19] My translation, here and henceforth, from the Norwegian text where Danbolt dismisses Hart, Fry, Newton, von Einem and Steinberg.

[20] Following Summers' (2003) distinction between 'real space' and 'virtual space'.

A Mediated Therapist (2008)

In the spring of 2008, a mediated therapist treated twenty patients remotely, in a workplace designed to support remote presence.[21] What is particular about the *mediated therapist* example is that it concerns a specific form of dialogic interaction, where *trust* is a core element.

5. The mediated consulting room with the piece of furniture designed to facilitate remote presence. To the right, a sitting area where the initial doctor-patient encounters took place. Both therapist and patients expressed positive feelings in regards to the interior design, which was deemed suitable for the intimacy required.

I have placed the example of the mediated therapist first in the row of my own design experiences because in a way, it sums up a prototyping process which was initiated in 2000 to 2001 with our first attempts to enable mutual gaze in presence design. Over the years, the prototypes have been improved, tested and adapted for different groups of users.

A similarity between this example, *Mediated Unemployment Services* and *Remote Affinity in the Archipelago,* which I introduce later, is that all three concern workplace design, which was the focus of my architectural practice in the 1990s. As I reflect upon twenty years of practice, several aspects come to light that concern the way people collaborate in work and learning environments. I also reflect on what architects contribute in terms of spatial and technical design towards facilitating collaboration and knowledge sharing.

On the day of the first appointment, patients were received in person, inside the mediated consulting room. They subsequently met the doctor remotely six times. On entering the mediated consulting-room at these later appointments, the doctor would receive the patient face-to-face, but as part of a furniture piece that was designed for remote presence and mutual gaze. The therapist herself sat in a similarly furnished workspace. The length of each therapy session was approximately one hour during which the therapist assessed the patient's health using conventional tools from Cognitive Behavioural Therapy (CBT) and based on many years of experience in treating similar patients.[22] The therapist took special notice of how she greeted patients remotely, but followed the same procedures she would have had she treated patients in a real space. She was able to fully perform her professional assessment of patients during the mediated dialogic interaction.

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[21] See Chapter 4 as well as the Appendix 2 for details. User study conducted in 2008 as part of the 'Mediated Spaces' project at the Centre for Sustainable Communications, Royal Institute of Technology. Responsible for presence design: Leif Handberg and myself, based on earlier prototyping by Mats Erixon and myself.

[22] The doctor who participated in the study, Agneta Ekman, MD, is a private consultant and specialist in psychiatry and occupational health. Patients were diagnosed using MINI (Mini International Neuropsychiatric Interview, rev. 060405), their mood was assessed using MADRS (the Montgomery-Åsberg Depression Rating Questionnaire), HAD (a diagnostic instrument Hospital Anxiety and Depression Scale) as well as EQ (diagnostic instrument by EuroQoL Group 1990).

I use this example because it shows that a mediated architectural extension serves this particular form of dialogic interaction sufficiently well for the doctor to perform her professional assessment. From the study, the mediated therapist concluded that she could carry out her work as well as she could have in a real space with the patients. Moreover, the doctor experienced the mediated therapy as less mentally exhausting than conventional practice, a result which is also supported by previous research (de las Cuevas 2006). The design explicitly provided a situation where the patient 'was seen' and where the design provided a frame in which the doctor's gaze became more prominent than in a shared real space. To reflect on my designer observations, *framing* and *transparency* are two of the concepts I use (in Chapter 7) to discuss factors that may inhibit knowledge-sharing and remote presence.

Another key concept in presence design is to enable *mutual gaze*, a distinguishing feature in this and other mediated environments I have contributed to. As noted earlier, mutual gaze can be related to the establishment of trust; I address this in terms of *frictions* that may inhibit knowledge sharing in collaborative environments. Throughout Chapter 4, I use different examples to discuss how the design frictions in real spaces relate to those of mediated spaces. Aiming towards an informed theory of workplace design which incorporates mediated spaces, I discuss these issues by introducing concepts such as *peripheral monitoring and awareness* and *frontal versus lateral forms of collaboration.*

With reference to the first mediated workplace designed at Xerox PARC (described as an early example of presence design in Chapter 3), one could characterize the mediated workplace for the therapist as a *sustainer,* perhaps not for a 'close working relationship', which was the case at Xerox PARC, but for the delicate intimacy and trust which the patient-therapist and patient interaction represents. The patient, we may conclude, was not *here,* yet *sufficiently near* to encourage the establishment of trust, and for the doctor to perform actions and form judgments based on professional skill. If mediated spaces can support such qualified dialogic interaction, there is reason to further discuss how presence design can be integrated to collaborative work and learning environments where the exchange of practical knowledge is key.

Mediated Unemployment Services (2005)

Between 2004 and 2006, I contributed to a EU-funded research and development project in the role of architect, furniture designer and researcher, to develop and implement mediated services for the Swedish Unemployment Services in the Dalarna region.[23] As an outcome of the project, staff and clients in eight different towns and villages of Dalarna meet daily, using the 'remote meeting-place'.

6. *Since 2005, staff and clients can meet remotely across eight towns and villages in the Dalarna region via this 'remote meeting place'. The sign on the door of the Unemployment Services says: "Remote meeting place. Talk here to an employment officer. We serve job seekers in the area of Malung, Vansbro and Sälen. It may be necessary to wait." The job seeker takes a ticket from the dispenser by the door. The door opens when it is his/her turn.*

How did we arrive at this design? Why is it a mobile piece of furniture? Like the other design examples I will refer to in Chapter 4, this is the result of an extensive design process where we explored the organisation's needs for meetings. Staff representing different Unemployment Services and located in eight towns and villages across the Dalarna region participated in the design process, which took place over several months. The background to the project was a stated interest in providing better services to job seekers in small towns and villages where the opening hours of the Unemployment Services had been steadily reduced in recent years. To maintain a minimum of opening hours, every other week, staff from larger offices in the neighbouring towns would drive several hours, often on narrow and icy mountain roads.

Seeking to understand the work-related activities, our project group visited each workplace, carried out observations and interviews with staff and job seekers and participated in several meetings. In parallel, we explored possible ways to establish a dedicated fibre-network between the eight offices in the region.[24] On our first visit to the Unemployment Services, a job seeker was registered, a process which involved meeting an employment officer in person for 10-20 minutes. A separate meeting was then booked where general information about the job-seeking process was received. This was a learning session to which several job seekers often participated as a group. Following the job-seeking process, everyone registered with the Unemployment Services was required to book follow-up meetings with an appointed officer in person. Although a range of other activities could be mentioned as part of the services provided, it was clear that the quality of the Dalarna Unemployment Services was formulated on the basis of *meetings in person*. In other areas, the

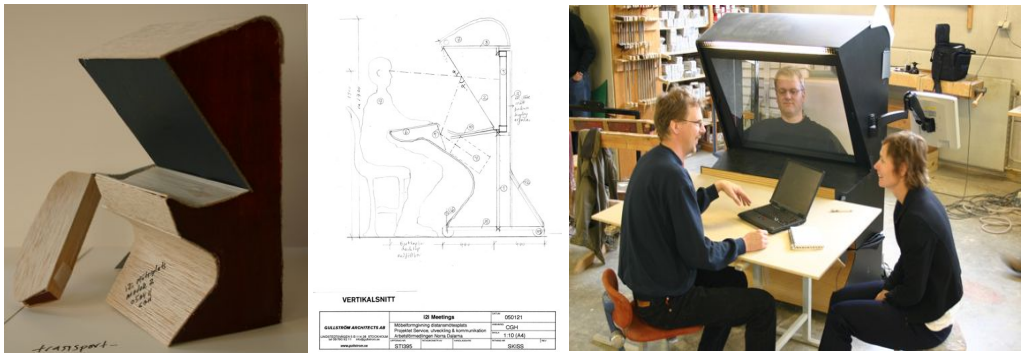
[23] See Chapter 4 as well as the Appendix 2 for details on this interdisciplinary research and development project, carried out at Teknikdalen Foundation in Dalarna, Sweden. Responsible for presence design: Mats Erixon and I.
[24] The temporary fibre network enabling uncompressed video transmission across Dalarna was made possible through the significant personal commitment of Mats Erixon, as was also the case with the *Remote Affinity* project presented in the next section.

Swedish Unemployment Services had taken measures to replace certain visits with telephone or web-based services. The Dalarna district, however, was reluctant to compromise the quality of personal communication with their clientele.

In December 2004, we summed up our impressions from the observation phase. One document formulated a brief for the participatory design process which took place with a group of users over the following several months. A general concept of 'remote services' was already formulated, but a series of specific questions were raised:

> How can the design of a meeting place ensure qualified personal communication between a job seeker and an unemployment officer? Is there, perhaps, an expectation to show that the personal communication in some cases can be further improved? We noticed that the current open plan environment not always renders possible this kind of conversation about a job seeker's personal and private situation. How, where and when the registration of new job seekers takes place and is organized therefore raised a general concern.[25]

In the process, the following activities of the Unemployment Services were prioritized: (1) Face-to-face meetings for registration of job seekers; (2) Remote participation (for 2-3 job seekers) in initial information meetings; (3) Face-to-face follow-up meeting with an appointed officer. We used workshops to stage and dramatize different scenarios that illustrated the expected mediated interaction between staff and clients. The idea of a mobile piece of furniture developed from this process, since the prioritized activities involved different parts of the workplace, and because it provided flexibility. The need for a height-adjustable piece of furniture also emerged, to facilitate mutual gaze in the interaction with people of different heights, or to provide wheel chair access, as well as the need to incorporate a hearing loop to the design. A general requirement was to minimize the risk of damage and to ensure that all users, regardless of disability, could access the remote meeting place, since the furniture would be accessible to the general public during office hours, and in some cases located in unattended public spaces. Little by little, our designs were refined and prototypes developed in dialogue with users. A primary concern was how work activities for unemployment officers would be affected by the changes and how, for example, staff would manage incoming remote visitors.



7. Because it was difficult for staff to visualize how the mediated interactions would develop, we used simple models, prototypes and dramatizations as a means to discuss the desired functionality of the furniture. In the picture above, I am in conversation with Björn Persson, an unemployment officer, assessing a design prototype in the carpentry workshop.

Increased exposure to different media has affected most professions, but while many people today are accustomed to moving between virtual spaces, it is not the case everywhere in society. Considering this – which sometimes is referred to as the 'digital divide' – it was important to use simulations to try to understand how clients and staff would relate using the mediated services.

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[25] Letter to the workgroup representatives at the Unemployment Services dated 041210, written by me, in preparation for a workshop one week later.

A key issue throughout the project was to provide a personalized service and we frequently returned to this topic when we discussed the shortfalls of web-based services or telephone services. These may be regarded accessible to all, but are difficult for many categories of users to manage. As one unemployment officer who participated in the work group later expressed, "Now I feel we are available to our customers." (Persson 2006)

In terms of the final outcome of our process, it is noteworthy that the remote meeting place provides the possibility for job seekers to meet an officer *in person*, however remotely, and also has the benefit of extending the opening hours of this public service.

8. *It was second on the list of priorities to enable remote presence for 2-3 job seekers at initial information meetings. Fourth on the list was to facilitate other desired staff meetings across the offices in eight towns and villages (several of which also included local social security services), such as shown here, a union meeting. Though not initially a top priority, staff meetings emerged as a frequent use of the remote meeting place.*

Remote Affinity in the Archipelago (2004)

***Informal* aspects of collaboration were the focus of this example of a mediated workplace, *the Remote Affinity* project, carried out in the Stockholm archipelago from 2001 to 2004.[26] This research project aimed to create a mediated work environment to strengthen collaboration and remote affinity between three call-centre workplaces, located on different islands in the Stockholm Archipelago (Ornö, Sandhamn, Arholma) and staff employed by the Stockholm County Police. The 10 to 20 employees in each office (many of whom worked part-time shifts) were colleagues, but only occasionally met.[27]**

9. The three-way mediated meeting bar designed to strengthen remote affinity among call-centre employees distributed in the Stockholm archipelago. Left, researcher Minna Räsänen, a social anthropologist, in conversation with call-centre employees (December 2004). Right, a photomontage illustrates the intended larger displays which, in the course of the project, were replaced by smaller displays due to budget reductions.

Separated by the sea, employees for the Stockholm Police call centres were only brought together as a group once or twice a year, typically for a conference, a course or for a Christmas party. Meanwhile, the telephone was their main tool for information exchange. This project began with a thorough participatory design process, which identified the staff's interest in obtaining a closer affinity with each other, as well as a need to improve and facilitate knowledge sharing between colleagues.[28] This process was led by a group of researchers representing the fields of social anthropology, cognitive psychology, industrial design and myself, an architect. The process resulted in discussions on how to incorporate a mediated spatial extension into the three workplaces, so as to support both formal and informal aspects of collaboration.

The primary work task of each call centre was to receive crime reports over telephone from the general public throughout the Stockholm area. Incoming telephone calls were placed in a queue via an automated call-distribution system and transferred to a staff member, at one location or another. As long as an employee was logged onto the system, calls would come in, with a five-minute break between each call. The number of calls distributed to each staff member was in proportion to how many operators were available at the moment. The knowledge of a queue of callers put employees under a lot of pressure. They were expected to take as many calls as possible, to respond to queries and to follow them up, which frequently involved conversations with staff at other call centres.

All three workplaces were open plan, with a similar layout but with different furniture and design. All had a separate kitchen and space for socializing, where staff would take breaks

[26] See Chapter 4 as well as the Appendix 2 for details. Interdisciplinary research project carried out at the Centre for user-oriented design, Royal Institute of Technology in Stockholm. The project and its extensive participatory design process is described in Westerlund 2009: 90ff; Lenman et al. 2002; Gullström et al. 2003; Räsänen 2007. Responsible for presence design: Mats Erixon and Charlie Gullström.

[27] Their primary task was the administration of criminal theft reported by telephone from the general public, a job which required frequent information exchange between the three call centres.

[28] Notably, the group manager in each location expressed a need for remote weekly planning meetings, to avoid the workday otherwise missed, for example, due to a brief meeting on the mainland.

and relax between shifts. An important decision concerned which part of the workplace ought to be remotely extended to the other islands. Some argued that the coffee area should be extended, since mediated social interaction was a primary function sought after. Others stressed the potential to improve information exchange and knowledge sharing, arguing that the office area should be extended instead. As an architect, I contributed sketches and models throughout the design process, first to visualize and direct the discussions and later to visualize the chosen functionality and design.

10. The group of participating researchers led a series of workshops to engage employees in the participatory design process during which the desired functionalities would be defined. As part of the 'open-door' concept, seven criteria that the mediated extension ought to fulfil were formulated: (1) reciprocity: If I can see and hear, then I am seen and heard; (2) user-friendliness: no management of video and audio required by the user; (3) eye contact: the possibility of mutual gaze; (4) always open: the door 'is open' between 7AM-10PM, unless deliberately 'closed'; (5) one work community – three islands: strengthen affinity; (6) natural responses: the remote location must not cause disturbance or further burden call centre practice, (7) resemble reality: an integration of technology and the current work environment. (From sketches 021129)

The final choice was a location as part of the open plan work environment. I formulated the points raised throughout the discussions as a design brief in which the aim was declared 'to support work-related collaboration and exchange, in such a way that informal social interaction would also be facilitated'. In discussions with each of the three call-centres (which at times we met separately, at times as a group), the analogy to establish 'an open door' between the islands emerged.[29] It was from such a collaborative process that the concepts *remote affinity* and *proximity* were given shared meaning and different functionalities were agreed upon.

In a conventional office layout, a door left open provides an opportunity to drop in on a colleague; it allows a group of colleagues to sense who is 'at hand', and to assess which moods currently prevail in the office. Such cues can be discussed in terms of 'reducing friction', thus facilitating interaction in collaborative environments, and are also applicable to presence design.

Eventually, the concept of a 'remote meeting bar' took form and a design and construction phase followed. Once implemented, the remote meeting bar strengthened *awareness* of the on-going activities in two other workplaces and thus facilitated informal contacts. Since it was easy to see who was at work at the moment it was also easy to make contact during the day.[30]

The colleagues were closer: *near*, although *not here*.

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[29] The design brief and concept of the 'open door' was discussed in workshops on the three islands on 2, 3, and 5 December 2002, based on my sketch dated 021129.

[30] After completed furniture design, production and extensive technical preparations (which included fibre transmission of uncompressed video), the three-way meeting bar was installed on two of the islands and on the mainland headquarters, which resulted in closer affinity also with the unit manager.

11. *The map shows the large distances that separate the workplaces located on small islands in the Stockholm archipelago. The small island of Arholma (70 permanent inhabitants)100 km north of Stockholm is fairly close to the Norrtälje offices of the Stockholm County Police, from where the group of call centres was coordinated. Ornö is furthest to the south (300 inhabitants) and Sandhamn (500 inhabitants) furthest out into the Baltic Sea. A boat journey from Stockholm to Ornö takes 3,5 to 4 hours and to Sandhamn 1,5 to 2 hours.*

The Mediated Museum (2008)

Following Chapter 5, I examine the extension of the Museum of National Antiquities in Stockholm to a neighbouring park area and excavation site, a project to which I contributed as an architect and researcher from 2007 to 2008.[31] The relationship between outside and inside is a central theme in architecture, and in Chapter 6, I make use of *framing* and *transparency* as concepts to address the issue of mediated spaces, windows and walls.

12. The design example of the mediated museum. The Museum of National Antiquities in Stockholm was temporarily extended to a neighbouring park area and excavation site. The spatial extension was framed by a glass door enabling museum visitors to interact with remote archaeologists and passers-by who attended the excavation.

In this example, I draw extensively on Le Corbusier and Mies van der Rohe, the latter of whom argued for the freedom which new tools provided architects in the 1930s. Today's architects and presence designers should take heed of Mies van der Rohe's 1933 statement:

> These are truly architectural elements forming the basis for a new art of building. They permit us a degree of freedom in the creation of space that we will no longer deny ourselves. Only now can we give shape to space, open it, and link it to the landscape. It now becomes clear once more just what walls and openings are, and floors and ceilings.[32]

The mediated window or glass door plays the role proposed by Mies: it gives shape to a museum space, opens it, and links it to the landscape.[33] We can note how materials, textiles and furnishings are combined to allow the human eye to experience an audiovisual architectural extension, through an interplay of reflection and transparency. Where the comparison to a conventional window clearly ends, however, is where we attempt to address the functionality of an exterior enclosing membrane, one that provides climatic protection or ventilation. Arguably, a window, or a door, can be opened and also represents a passage between indoors and outdoors. This is a theme that architecture has treated in many different ways – one that may be amplified and illuminated by the mediated window.

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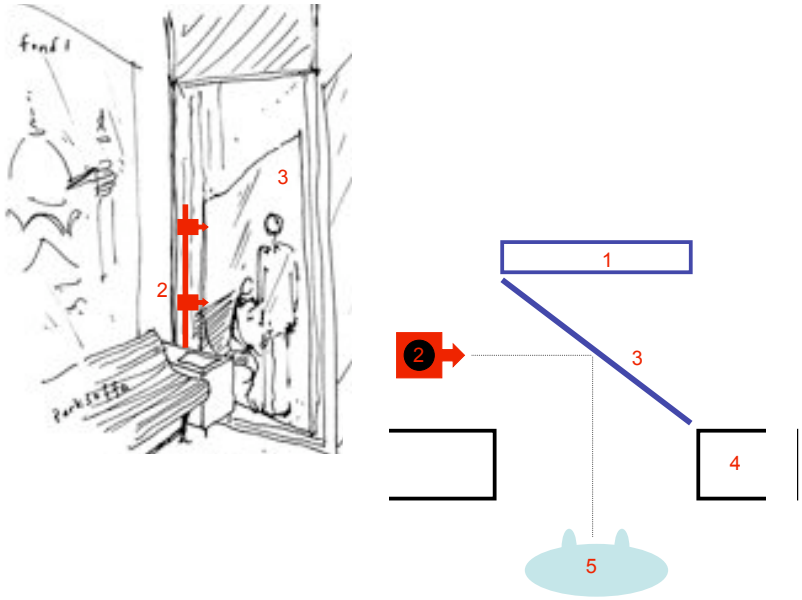
[31] See Chapter 6 as well as the Appendix 2 for details. This collaboration between the Museum of National Antiquities and the Royal Institute of Technology was carried out as a pilot study for the 'mediated museum' research group, as part of the research project 'Remote Presence to cultural heritage environments', funded by the Swedish National Heritage Board. Responsible for presence design: Gullström and Leif Handberg.

[32] Mies van der Rohe, in his 'Address to the Union of German Plate Glass Manufacturers', March 13, 1933. The quote appears in English translation in Tegethoff 1985: 66.

[33] In architectural discourse, the architect Mies van der Rohe is commonly referred to by his first name, Mies. Henceforth, I will follow this convention.



13. *The design concept which enables mutual gaze between people in two different locations. No technical equipment was visible to the passersby, but the curtain on the left shielded two video cameras, placed above one another at different heights (at an approximate child eye-level and adult eye-level, respectively). This adaptation of a teleprompter (Rosenthal 1947) has been developed by myself and my colleague Leif Handberg as a simple and inexpensive means to enable mutual gaze. It includes a sheet of coated glass (sometimes called beam-splitter) which, placed sideways at 45° in relation to the camera lens, will allow the camera to capture a person facing the glass-door, and at eye level. What is captured at the remote location may be displayed locally using back-projection or displays integrated with the overall interior design, thus creating more integrated mediated spaces.*

14. *At the exterior location, the window of the glass-door was smaller in size. Passers-by were invited to participate in the excavation, guided by professional archaeologists and researchers. Researchers and staff inside the museum contributed as remote guides. To the right, I am in conversation with the Swedish Minister for Culture, Lena Adelsson Liljeroth, while Li Kolker, pedagogue at the Museum of National Antiquities, participates remotely.*

I use this example to discuss whether the different possible ways to represent the passage from indoors to outdoors, available in art and architecture, are fully taken into account in presence design. Might a mediated window be regarded as an architectural element? A building material? To answer this requires a discussion of the emergence of the window as an architectural element; this in turn leads to an examination of the origins of glazing.

This is what I undertake in my account of *framing and transparency* in architecture, art and presence design (in Chapter 6) in order to substantiate my designer observations of the mediated museum. As several scholars have observed, the development of glazing technologies goes hand in hand with the implementation of glass as a new building material in architecture (Friedberg 2006; Elkadi 2006; Armstrong 2008). I expose the window as a '2000-year old space-problem', to reference a study by Nordenfalk (1973), in order to argue that a mediated window can be compared to earlier glazing technologies which enabled the human eye to establish a unity between one space and another, and therefore propose to explore what distinguishes the mediated window as an architectural element and building

material. Nordenfalk uses well-known examples from the history of visual art to draw a parallel between the glazing technologies of architects Frank Lloyd Wright and Le Corbusier, with how French artist Pierre Bonnard treated the interior and the landscape as if 'the passage between outdoors and indoors [were] free'. While *transparency* therefore may be a useful concept to use in the context of presence design, we are looking at two different ways of achieving it. The transparency of a glazed window comes in the form of silicon dioxide – to which soda has been added to facilitate melting, and lime, as a stabilizer against the adverse effects of water – whereas transparency in the case of the mediated window is achieved by means of cameras, projections and a chosen means of transmission.

Richard Lanham has addressed transparency in a way which may be applied to the mediated window. He refers to how one may look either *at* a textual surface or *through* it (Lanham 1993: 5), which corresponds with the designer observations I present as part of Chapter 6.

Atwood in Norway (2008)

The last in the row of design examples I have chosen to introduce is not designed by me, but by my colleague Claus Aase Schibsted Knudsen, who excels as a presence designer in Norway.[34] I use Atwood in Norway, like the previous example, as an example before Chapter 7, where I observe a range of concepts and strategies available to presence designers today.

15. Renowned writer Margaret Atwood shares a table with Simen Ekern, op-ed editor of the Norwegian Newspaper 'Dagbladet'. Image captured from live streaming (Dagbladet 2008). For details see Knudsen & Puijk 2009.

'What a thrill it is to be here!' Margaret Atwood exclaimed as she addressed the audience of the Norwegian Festival of Literature in May 2008. Atwood was invited to discuss her recent book *Oryx and Crake*, from 2003, with Simen Ekern, op-ed editor of the Norwegian newspaper *Dagbladet,* and to perform a public reading. The open-air venue at Lillehammer was brimming with excitement as Atwood and Ekern sat down for an informal chat, facing one another across the small dining-room table, which had been dressed with a white tablecloth, on the elevated stage. The high expectations were of course due to the fact that Margaret Atwood is a renowned writer, but also to her being present in Lillehammer *whilst actually remaining in Toronto, Canada.* The Lillehammer performance venue was, in fact, temporarily extended to Toronto and to those witnessing her reading, it was clear that Margaret Atwood both *was*, and *was not*, present in Lillehammer.

Although it may be deemed useful to discuss the philosophical grounds for such a statement, the focus here will be to observe the underlying design strategies which have enabled this and other seamless extensions of space. I will distinguish between attempts to create *architectural extensions* and designs which aim towards *spatial relocation*, arguing that in juxtaposing material and immaterial elements, designers today face similar challenges and opportunities to those faced by Sergei Eisenstein, which he addressed through the concept of *spatial montage* in 1938. Eisenstein regarded architecture as the predecessor to film and he often compared the three-dimensional capacity of the new media with that of architecture: "The Greeks have left us the most perfect examples of shot design, change of shot, and shot length." (Eisenstein ca. 1938: 112)

Now it can perhaps be argued that architecture, through the integration of new media, can recuperate its capacity for 'tertium quid'; Eisenstein's reference to the third element, or entity, which constitutes a whole greater than the sum of its individual parts (1992). Recent

[34] See Knudsen & Puijk (2009) and http: //tide.hil.no. Responsible for presence design; Claus Aase Schibsted Knudsen and Roel Knudsen based on earlier prototyping by Mats Erixon and Charlie Gullström. Schibsted Knudsen was part of the iSpace research team at KTH (Gullström et al. 2002) whilst carrying out his doctoral studies at KTH (Knudsen 2004) and has subsequently applied and developed a teleprompter design to enable mutual gaze, developed by Mats Erixon and myself from 1999 to 2003, through different projects. Claus Aase Schibsted Knudsen is currently professor at Lillehammer University College, Faculty of Engineering Production and Film Studies.

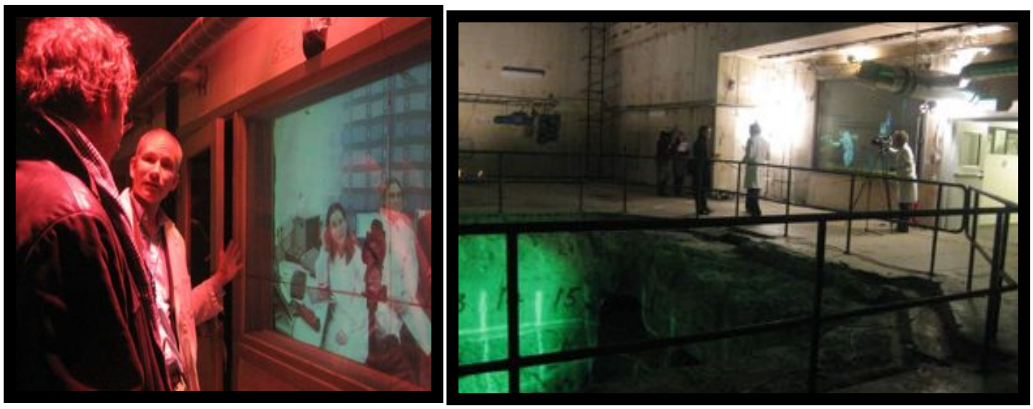
developments in art, media and architecture in fact point towards a fruitful intertwining of practices. This has potential also for presence design, as a new practice, and its capacity to transgress disciplinary boundaries. Collaboration between people with varied professional skill sets, however, requires a shared foundation and commonly held understanding of the spatial and technical considerations which are involved in presence design. My spatial analyses of *Atwood* and other presence design examples aim to contribute an awareness of how the spatial mechanisms operate, specifically the relationship to different spatial layers. I will discuss how, in presence design – as in society generally – certain visualities are favoured over others, thereby impacting human patterns of behaviour.

To expand upon the themes that are raised in the above example, I use my own prototyping experiences: two short user studies, both carried out in the context of international conferences in 2008, *The Mediated Pub* and *Mediated Mingling Between Two Conferences* (see description in Appendix 1, 'Further Design Examples'). My aim is to highlight the complexities of assimilating spatial and technical design, and to show that presence design requires a close collaboration between people with several different sets of professional skills, many of which can be acquired only through experience in a specialized field. Using an excerpt from a conversation within the design team, as we made the final adjustments to the prototype, I show how our dialogue referred to previously shared experiences and that our designer observations, reflections and assessment regarding 'what worked' and what needed to be adjusted were founded on a reflective practice, in this case, an interdisciplinary collaboration stretching over ten years.

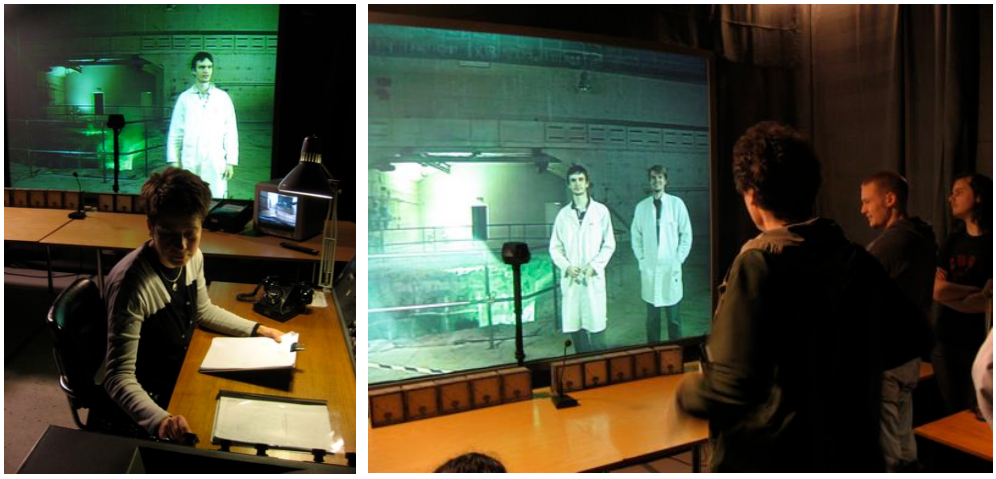
16. *Left: 'The Mediated Pub' which extended the Stockholm Resilience Conference to York, England, in 2008. Nobel prize winner Ellinor Ostrom is seen in conversation with Johan Rockström, head of the Stockholm Environmental Institute. Responsible for presence design: Gullström, Jonsson & Handberg. Right: 'Mediated mingling' between two conferences in Stockholm in 2008: ' The eChallenges' conference held at the Grand Hotel and the Nordic Cultural Commons conference at KTH. Alex Jonsson, KTH, entertains conference delegates at Grand Hotel, remotely. Responsible for presence design: Gullström, Jonsson, Handberg.*

Although the analogy to a window and a glass-door is frequently employed in my exploration of presence design, it is not the only approach I use to analyze the 'spatial relocation strategies' used by designers. I also show how additional surfaces may be used to provide extended views of a remote location, to the benefit of *shared mediated space*, a useful concept in presence design. The design below (for a relocated control room of a decommissioned reactor hall) is one such example. Here, large projection surfaces were used

to create the effect of wall openings rather than windows.[35] By providing sufficiently large, or several, representations of a remote location, the design heightened the experience of an architectural extension and the notion that one space was extended to another. In the Norway example, we were left in doubt whether Margaret Atwood shared the spatial experience of those present in Lillehammer, but here, the relationship between the two spaces is clear. As we move from one space to the other, we experience a slightly different view, but it appears as a reciprocal spatial relationship. The *Mediated Control Room* and a few more examples are discussed in Appendix 1, 'Further Design Examples'.



17. *The example of the Mediated Control Room. The original cultural heritage setting which constitutes my own research laboratory, the KTH R1 Experimental performance space (www.r1.kth.se), a decommissioned nuclear reactor hall on the KTH campus in central Stockholm. The original control room is behind the window. Below are photos taken from a 'new' control room recreated in another location.*



18. *Size matters: a large display can promote the experience of architectural extension. The 'new,' recreated and relocated control room seen above was equipped with steering panel, allowing visitors to monitor certain effects inside the reactor-hall. Visitors to the two locations could interact remotely. Designs by students in the course 'Presence Production', led by Gullström & Handberg (2008).*

[35] In this specific context, the design served to enable remote presence to cultural heritage environments, sites to which access is limited or where human presence or physical alterations may have an effect on cultural heritage values. See Appendix 2, 'Remote presence to cultural heritage environments'.

MOTIVATION

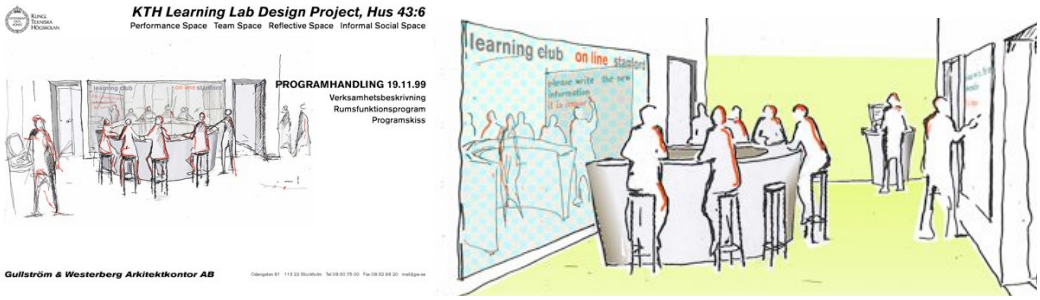
Ludwig Wittgenstein famously drew the duck-rabbit to distinguish between the 'continuous seeing' of an aspect and the 'dawning' of an aspect: "The picture might have been shewn me, and I never have seen anything but a rabbit." He demonstrated that we can "see the illustration now as one thing now as another. So we interpret it, and see it as we interpret it."[36] The distinction between *seeing that* and *seeing as* has been an underlying motivation for me in this thesis. Let me give two examples:

It is possible to see that Leonardo da Vinci's *Last Supper* is a painting on a wall, but one can also see it *as a mediated spatial extension.*

It is possible to see that my examples of mediated spaces, walls and windows are created by means of video and media technology, but it is also possible to see them *as architectural extensions.*

It all depends on how you look, on different ways of seeing. I have wanted to contribute the possibility of seeing presence design as architecture and a concern for architects.

In comparing my very first sketches in presence design, such as the E*xtended Bar from KTH to Stanford* or the *Face2face Video Bar* drafted in 1999 (see illustration below), with the more recent examples introduced in the previous section, it is clear that many design aspects are similar. Over the years I have worked with architectural design projects and research projects which have the common goal of facilitating collaboration and knowledge sharing in work and learning contexts. While some design contexts may have demanded an emphasis on architectural design to support formal interaction, others are founded on the needs of informal exchange and social interaction. It is from this process of reflecting on the similarities between projects – triggered by my combined practice as architectural designer, presence designer and researcher – that my mission *to explore presence design as a means by which architects can facilitate meetings* has emerged. To put my personal design experiences in context, therefore, the illustrated overview on the next page serves to show how my research-by-design process has evolved over the years. I shall return to this topic of methodology in the section 'Method: research by design' in Chapter 2.

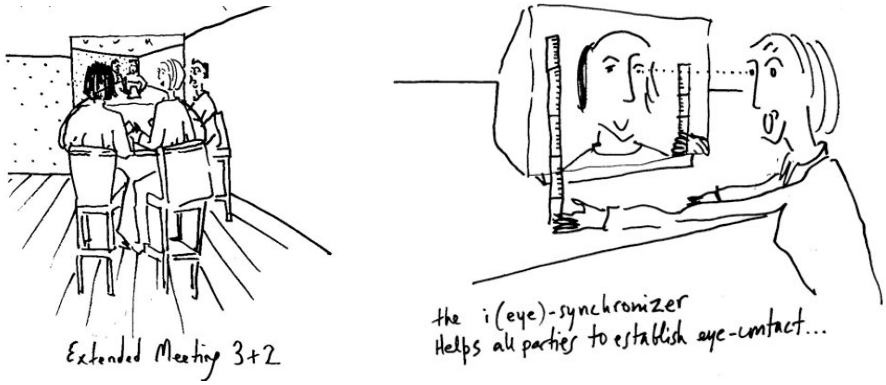


19. Early drafts. The sketch for an 'Extended Bar from KTH to Stanford' on the cover of the design brief produced by my architectural practice for KTH Learning Lab, in 1999 (See Appendix 2 and Wallenberg Global Learning Network 2010).

[36] The quotes and the sketch of a duck-rabbit appear in Philosophical Investigations (Wittgenstein 1953, Part II, XI) refer to a more detailed drawing by Jastrow which can either be seen as a duck or as a rabbit (Jastrow 1899: 312).

20. The 'Face2face Video Bar' as proposed for new learning facilities for the Stockholm School of Economics, also designed in 1999. The idea was to create a table that folded open, revealing the remote parties (See Appendix 2).

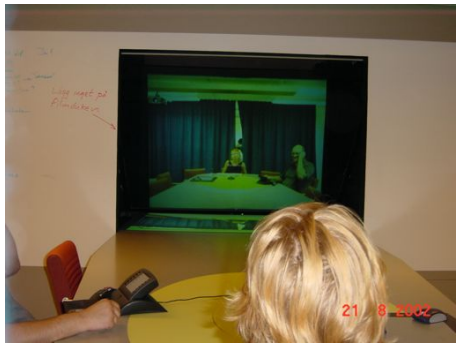
21. The first prototypes to enable mutual gaze emerged as part of the iSpaces project from 2001 to 2002, and were based on a design by Mats Erixon and myself. The display (transmitting the remote location) was resting horizontally beneath the tabletop, and the image was reflected onto a coated glass ('beam-splitter') at 45°. The camera which captures us is placed behind the glass in this set-up. Filming through glass has negative side effects and the production of the beam-splitter was costly and delicate, which is why this solution was later abandoned. Since 2007, our prototyping is based on the design concept illustrated as part of the Mediated Museum project (cf. fig. 15 by Gullström & Handberg).

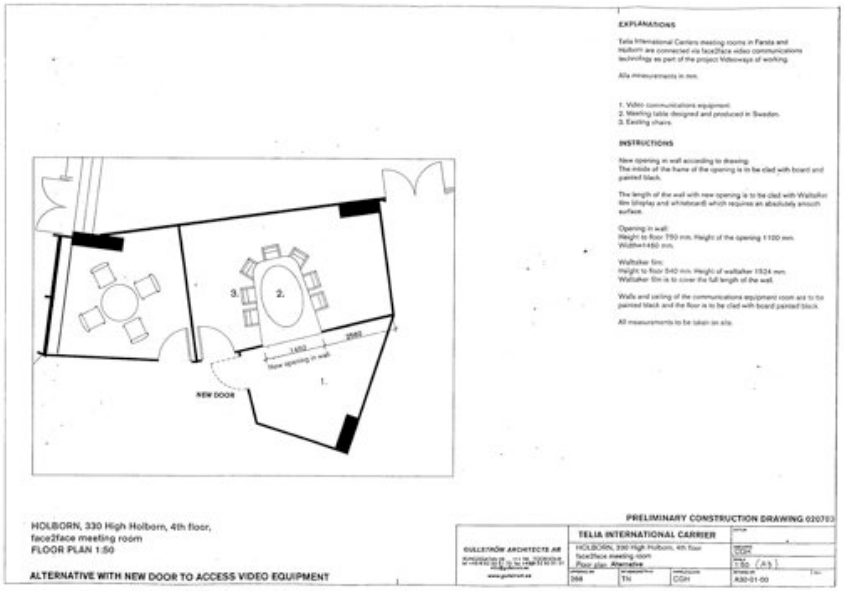


22. The underlying idea of the video bar in this learning context was to facilitate remote participation in academic seminars and tutorials. The iSpaces project addressed the need to combine architectural and technical design to support different modes of learning.[37] The 'i-synchronizer' aimed to facilitate the remote adjustment of a camera.

[37] For a description, see Appendix 2 as well as Wallenberg Global Learning Network 2010; Lahlo 2009: 207ff; 'iSpaces' 1999.

23. *We needed to perfect the prototypes because the iSpaces workgroup consisted of researchers at both KTH and Stanford University in California. At Stanford, our colleague Andy Milne is seen. He projected our image onto a wall and pierced a small hole at an approximated eye-height, allowing a camera lens to capture his space.*





24. *The prototypes were refined for a commission in 2001 for Telia International Carrier, a Swedish telecom with offices in Stockholm, London and Reston, US 'The Three Halves' –half meeting rooms –were given a similar design, lighting and furniture as a means to support balanced meetings between office workers in Stockholm, London and Reston. Design by Gullström Architects and Mats Erixon.*

chapter 2 research themes and methodology

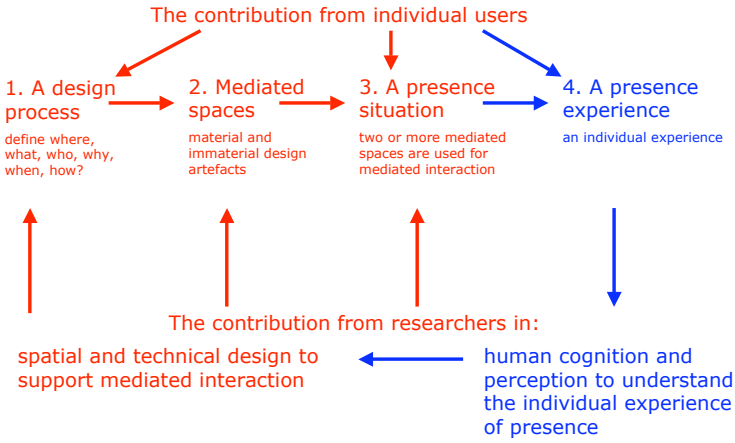
2

SHARED MEDIATED SPACES & PRESENCE DESIGN

The origins of media space research can be traced to a video-mediated work environment for a group of Xerox PARC researchers who were geographically divided between campuses in Palo Alto, California and Portland, Oregon in the early 1980s (Bly et al. 1993). The background of this and a few other creative research milieus that formed in the 1960s can be found in the development of ubiquitous and tangible computing to support collaboration between people who, for example, worked in different locations (Weiser 1991). As my survey will show, a number of architects were involved in the formative years, when these milieus developed and when the technical foundations for mediated spaces were laid. In spite of the early contributions of architects, however, subsequent research in this broad field has focused more on the concept of usability and the design of collaborative tools and less on the *hybrid, cybrid*, or, as labelled here, the *mediated* spaces in which such interaction takes place.[38]

At the Royal Institute of Technology in Stockholm (KTH), an interdisciplinary research group with combined skills in architecture, media technology, anthropology, film, and broadcasting has focused on spatial and technical designs to enable *mediated interaction* and *mutual gaze*. Our ongoing prototyping process has, over ten years, resulted in numerous *mediated spaces, windows* and *walls*, i.e. design artefacts emerging from different contexts of use and design, where participants in different locations experience a sense of *remote presence* negotiated through dialogic interaction (Enlund 2001; Lenman et al. 2002; Knudsen 2004; Gullström et al. 2003, 2008; Gullström & Handberg 2008; Gullström 2006, 2008, 2009, 2010; Räsänen 2006, 2007; Handberg 2007). Our work has been informed by user-driven innovation and participatory design contexts at the Royal Institute of Technology over the last fifteen years (Tollmar et al. 1998; Hedman 2004; Ilstedt Hjelm 2004; Junestrand 2004; Taxén 2005, Taxén et al. 2004; Rossitto 2009; Westerlund 2009, Jansson 2009).

The illustration below shows our design-driven presence research process, as informed by users and by research in related fields.



25. *Illustration of 'The Presence Design Process' (course material developed by Leif Handberg and myself in 2009) In designing for presence, a design process strives towards a combination of spatial and technical design that meet users' needs. The design artefacts which emanate from these processes are both material and immaterial: mediated spaces are architectural extensions created from a juxtaposition of real space and virtual space to support mediated interaction between people in different locations, a context of use we refer to as a 'presence situation'. Each individual user will experience the situation differently: the presence experience is individual.*

[38] My research colleagues and I chose *mediated spaces* as an abbreviation for *video-mediated spaces*. In comparison, Zellner (1999) uses the term *hybrid* space to challenge the long-held conventions of space, and defines hybrid spaces as created in the breeding of ideas with form, the real with the virtual. A similar concept is *cybrid* space introduced by Anders (1999). Several variations exist, e.g. Perrella (1998) developed a *Hypersurface Theory* for architecture that does not assume real/unreal, material/immaterial dichotomies.

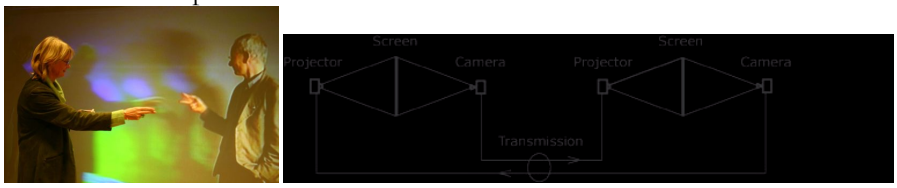
In his comprehensive anthology of spatial topologies, David Summers provides an elementary definition of space which is useful here:

> *Real space* is the space we find ourselves sharing with other people and things; *virtual space* is space represented on a surface, space we 'seem to see'. In fact, space can only be represented visually as virtual, but at the same time we always encounter a virtual space in a real space. (2003: 43)

Although Summers' simple definition of virtual space differs greatly from scholars who assume the involvement of computing, it would suffice to denote computer displays, projection screens as well as the pages of a book or a canvas for painting. With frequent reference to virtual reality, computing contexts often denote 'virtual space' as "the creation of an illusion of 2D or 3D space created by the use of microprocessors, computer memory, and telecommunications networks" (Rutenbeck 2006: 2).[39]

26. A 3D anatomical scene of the human thorax in a virtual environment. Virtual reality environments typically emerged from the realm of medicine and flight simulation, where grasping and moving an object allows a user to explore parts of a scene. (Beutel et al. 2000: 87).

Also in reference to computing, the Oxford English Dictionary definition provides a similar definition of 'virtual' as "not physically existing as such but made by software to appear to do so from the point of view of the program or of the user." Although clearly applicable to computer-generated virtual environments, such as Second Life or similar internet-based virtual communities, these definitions make little sense to people in video-mediated spaces.[40] In shared mediated spaces, it is apparent that those present (though in a remote location) are *real people* – and although perhaps initially startled by the experience of remote presence, users become aware of the juxtaposition of two (or more) *real spaces*, none of which are computer-generated, just video-mediated.[41] Computers can be used in the creation of mediated spaces, but in their most basic form, mediated spaces do not require the involvement of computers.



27. The audiovisually extended architecture which this thesis addresses is video-mediated, but not necessarily computer-generated. A video-loop is simply created by connecting two cameras and two displays. As seen above, the two persons appear to share the same space, although back-projection is used to the effect of a mediated wall. (Gullström & Handberg 2009)

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[39] Cf. Kalansky (1993), Krueger (1983), Englmeier et al. (2000: 67ff). The definitions vary in terms of the degree of immersion and interaction the environments create, frequently with the use of stereo-viewing goggles and reality gloves. The term 'virtual reality' was coined by Jaron Lanier, founder and CEO of VPL Research, US, in 1989 as an umbrella concept for several projects involving computer-generated three-dimensional environments (Krueger 1991). Kalansky extended the definition to 'virtual environments', in which people are immersed in a computer simulation, which includes visual, auditory as well as tactile and force sensations (Kalansky 1993).

[40] See: http: //www.secondlife.com.

[41] It is interesting to note William Gibson's definition of 'cyberspace': "a consensual hallucination of high-definition immersive graphical representation of data" (Gibson 1984). Gibson avoids the term computing, although computers are immanent to the fictional mediated spaces he designs in his seminal book *Neuromancer* (1984). The etymology of the term 'cyberspace' is rooted in the Greek 'kubernetes'. As noted by Neil Spiller, it was first used by the 19th century scientist André-Marie Ampère in his theory on magnetism and picked up by Gibson in 1984 (2002: 7).

The numerous possible ways of combining spatial and technical design to support mediated interaction are here referred to as 'presence design'. In order to capture audiovisual information from one location and to adequately reproduce it in another, different technical devices are required, as well as a means of transmission. Computers may be involved in the design of mediated spaces, and frequently are, but are not a necessity.

The prevailing narrow definitions of 'virtual' space appropriated by computing discourse thus seem to exclude video-mediated spaces, as discussed here. As noted by Kisielnicki, such definitions imply that virtual spaces evolve as completely new worlds (2002: 68), whereas, in fact, video-mediated spaces merely represent existing real spaces.[42] I therefore opt for Summers' broader definition which echoes earlier, pre-computing etymologies that may include *represented* (or *reproduced)* existing real spaces, *virtual* in the sense they are "not actual but equivalent, so far as effect is concerned", as formulated by Webster's New Twentieth Century Dictionary.[43]

Henceforth, I will thus use the term 'virtual' to denote a reproduced remote location, which forms part of a mediated space. Here, I am close to Anne Friedberg's definition of 'virtual' as "electronically mediated or digitally produced images and experiences" (2006: 7). Consequently, I characterize mediated spaces as a juxtaposition of existing real spaces and those reproduced (i.e. 'virtual'). Designing mediated spaces, I suggest, consequently necessitates a form of *spatial montage* or collage, which involves the use of media technology and often computers. I will on occasion use the term 'digital' in reference to video-mediated spaces, which may, but not necessarily, be computer-generated.[44] For, as Elisabeth Grosz has remarked: "[W]e did not have to wait for the computer screen or the movie projector to enter virtual space; we have been living in its shadow more or less continually." (Grosz 2001: 79) Many researchers have grappled with the question of how to address the emergence of virtual spaces, as I will discuss in the following section.

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[42] Krueger chose the term 'artificial reality' to denote video environments he created (1983). Knudsen, among others, uses a general acronym which avoids any spatial complexity: VMC (Video-Mediated Communication), defined "as a general term for all types of synchronous communication where two or more geographically separated participants are involved and the media technology used is based on video and audio" (Knudsen 2004: 5). Knudsen qualifies VMC by introducing three terms which describe "different characteristics from a user point of view": (1) Physical space ("space perceived as real"); (2) Extended space ("space which may be transported using telecommunications technology and displayed or projected in geographically separated environments); (3) Mental space (internal mental representation of a real or imagined space") (ibid.: 37f).

[43] The full definition of Webster's New Twentieth Century Dictionary (1949) reads as follows: "1. Having the power of acting or of invisible efficacy without the material or sensible part; proceeding from or characterized by transference of virtue, that is, force, energy, or influence. 2. Being in essence or effect, not in fact; not actual but equivalent, so far as effect is concerned" (1949). It is interesting to note how this formulation has been adapted in later editions, cf. Webster's Online Dictionary: "Being such in essence or effect though not in actual fact". The primary definition the OED provides is similar but qualified as "now rare." ("1.a. Possessed of certain physical virtues or capacities; effective in respect of inherent natural qualities or powers; capable of exerting influence by means of such qualities.")

[44] 'Digital' originates from 'digit', "to point out with the finger" and as appropriated by computing, at the earliest in 1938 to designate "a recording in which the original waveform is digitally coded and the information in it represented by the presence or absence of pulses of equal strength, making it less subject to degradation than a conventional analogue signal; of or pertaining to such recording" (OED).

THEORETICAL FRAMEWORK

In her illuminating survey of visual practices and theories of perspectives and optics, *The Virtual Window: From Alberti to Microsoft,* Anne Friedberg (2006) explores the paradigm of windows – window frames as well as media screens of the 'cinematic century' – which, she claims, fix spectators in a position of immobility. Friedberg, like Jonathan Crary (1992), shows how a long-held paradigm is currently being sustained by artists and architects, one which creates spectators. Friedberg ends her book by acknowledging new 'postcinematic' visualities that have, more recently, brought on a shift, a "codependency of the movie screen, TV screen, and computer screen", which as Friedberg argues "allows us – in ways that neither Bergson or Einstein could have foreseen –to inhabit, in a *virtual* sense, two or more spaces at once, and equally, two or more times" (op. cit.: 146). Friedberg's book does not address this further, but argues that our visual field is still framed by the earlier paradigm: "This new space of mediated vision (…) remains within the delimited bounds of a frame and seen on a screen." (6f)

My interest in Friedberg's window and how it frames our vision lies in exploring whether mediated spaces, by necessity, will fall under the earlier paradigm of frame and screen as well. Would it be possible to regard mediated spaces as something other than 'screens' or 'windows', namely as architectural extensions, delineating three-dimensional space? Are we forever framed by Friedberg's window, as we now involve media in designing spaces – I rhetorically ask – or, is it possible to juxtapose real and virtual space in such a way that spectators are able to move freely, throughout mediated spaces?

Considering all the equipment we now use as part of work-life, Lev Manovich has commented that we are carrying our prisons with us. By this he means that as long as we live in a screen-society with closely monitored (and monitoring) ATM machines, super market check-outs, car dashboards, computer screens and "buildings whose facades have been transformed into giant displays and that in spite of interactivity, simulation and telepresence…" we still have not left the era of the screen (2001: 115). How to render three-dimensional spaces in a way that they are not interpreted as screens remains an important challenge to architects dealing with composite space.

To explore the relationship between presence design and architectural design, which constitutes a primary theme throughout my thesis, I expose different strategies by which spaces are joined and analyze the designs which structure our vision and mobility as spectators. The mediated window is one strategy – like a conventional window, it can be used to establish an opening in a mural; one which joins an exterior and interior space. Mediated windows can, I suggest, be compared with other possible ways of extending one space into another – for example, by means of spatial montage – which allow us to interact and 'inhabit two or more spaces at once'.

My ambition – since Friedberg does not address mediated spaces – is thus to pick up the baton and to continue the exploration of this important new area of research. As noted by Jay Bolter and Diane Gromala, the task of designers henceforth is to challenge the 'myth of transparency' and the 'myth of the natural interface' (Bolter & Gromala 2003). I interpret this as an urge for architects to face the thresholds and liminality of real and virtual space. The simple fact that virtual space can only be accessed via a real space (Summers 2003: 43) presents a new situation for architects, as traditional designers of real places. It is the spatial design of such liminality (liminal, hybrid spaces) which concerns me here.

One of the main contributors to, and advocates for, developing scientific presence measures, by combining subjective and objective measures (postural, physiological or social responses to media) is Wijnand IJsselsteijn (2004; IJsselstein & Riva 2003). I will discuss the framework of one study since it relates to the prototypes of mediated windows I contributed to personally, but also because it allows me to illustrate a different focus and methodology to presence research and thus define the specific contribution of my own design-driven research. Interested in the psychological and physical effects that windows have on well-

being in contexts of work and health care, IJsselsteijn et al. (2008) conducted an experiment to identify the essential perceptual elements for the design of a *virtual window*. Three *depth cues* were tested in the study: movement parallax, blur, and occlusion. All three were important to engendering a 'see-through experience', with movement parallax yielding the greatest effect. As noted, IJsselsteijn has previously defined depth cues as essential critical features in comparing how individuals perceive real space and virtual space (2004). The current study aimed to investigate whether, in comparison to displays of static scenes, a more convincing 'see-through experience' using a simplified approach to generating movement parallax in addition to a few other monocular depth cues would give rise to "a more convincing illusion that one is looking through a window at an outdoor scene, rather than a flat image projected on the wall" (IJsselsteijn et al. 2008).

Previous studies of window function (e.g. provide a view to the outside, light source, awareness of weather and time of day, ventilation, situational and orientation cues) have shown that the view to the outside is among the most significant (Nagy 1998).

For a static observer, a view onto an outdoor scene already provides a rich variety of monocular and binocular cues to depth, including linear perspective, occlusion, texture density gradients and binocular disparity (Cutting & Vishton 1995). Each of these provide a fairly ambiguous indicator of distance, layout and surface structure, but when combined, the multiple cues strengthen each other through a process known as *depth cue integration*, "uniquely specifying layout as seen from the observer's vantage point" (IJsselsteijn 2007).

Another core element of depth cue integration is that dynamic depth information is coupled to observer movement. As we move our eyes, heads or bodies sideways, more distant objects will shift by smaller angles across our retina than do objects located closer by. This source of visual depth information is known as *movement parallax* or *motion parallax* implemented to the benefit of, for example, interactive computer graphic systems and head-tracked desktop systems (Fisher 1982). To this effect, objects at different distances change their relative positions, but also the window-view relationship changes (Valois 1990; Markus 1967). With IJsselsteijn's approach in mind, several other researchers have tested the role of movement parallax using motion-tracking or eye-tracking methods in creating a window substitute from a wall-mounted display, e.g. Radikovic et al. 2005.

These studies show the limitations of two-dimensional artificial windows, such as the computer screens to which Friedberg refers (2006), which may be regarded as unrealistic and lacking in 'depth-of-view', aimed to explore how virtual windows may be applied to settings where access to a view to the outside is problematic for some reason.

In contrast, the prototyping to which I have contributed, and was carried out in a very different methodological framework, confirms that as long as the mediated architectural extensions are populated by people, quite simple means may be used to address the issues that IJsselsteijn (2004) identified as important. Whilst recognizing the large body of research which has defined the determinants of presence and which has concluded that "increasing the breadth and depth of sensory experience – increasing the perceptual bandwidth, if you like – will automatically improve the media experience" (IJsselsteijn & Riva 2003, section 2.9), it is important to recognize that the same researchers also confirm that "intensity does not equal quality" and that "the psychological impact of content, both good and bad, exciting and boring, depends to a large extent on the form in which it is presented" (ibid.). Our prototyping, for example, shows that with limited bandwidth and moderately priced displays and TV monitors, one can achieve effective presence design.[45] The value of research to establish precise measures, not least for further product development, is unquestionable.

[45] Some of the presence design examples to which I have contributed and that are referred to here are based on IP over internet, with a transmission capacity limited to 600-1900 kbit/sec, such as the remote conferencing examples described as part of Chapter 7. From our designer observations, we found this sufficed for the experience of mediated presence, asserting that a combination of spatial and technical design (e.g. enabling mutual gaze, experience of architectural extension, etc.) can compensate for a limited transmission capacity, thus making it comparable to other cases where uncompressed fibre connections were used, such as in *Remote Affinity in the Archipelago*, *Mediated Unemployment Services* and the *Mediated Museum*.

However, it is as important to observe the contribution from other research areas, especially those which stress social and behavioural aspects of presence design, such as the relationship between (witnessed) mediated presence and trust in mediated interaction (Nevejan 2007). It is in this light one may consider my attempt to relate presence design to architectural design as a contribution from a design-driven, design-led research perspective.

Another area of research relevant to presence research is the neuropsychological perspective provided by, for example, Antonio Damasio (2000) and Giuseppe Riva and colleagues (2004). Antonio Damasio and fellow neurologists[46] studied emotions, consciousness and the brain of psychiatric patients, developing a neuropsychological understanding of the human brain based on the drive for survival that exists within every organism (Damasio 2004). Damasio distinguishes between three *levels of consciousness* of the human 'self': (1) *the proto-consciousness* continually traces the physical state of our body, as an inner and unconscious experience of the self; (2) *the core-consciousness* is an experience of the self which is generated through the confrontation between the self and its environment in the present 'here and now'. Self-awareness is triggered when an object outside the self is in the same environment at the same place and at the same time; (3) *the extended-consciousness* is a layer which includes all memories of the experience of self (the proto-, core-, and previous experience extended) as well as its cognitive understanding. This third layer helps a person interact with the world, enables a person to learn, to speak languages and to plan his/her actions. It is a crucial layer, since it enables us to distinguish between internal and external experiences, between what is imagined and what is experienced.

Riva et al. (2004) have applied Damasio's theory to presence research, arguing that presence is a feeling that human beings have developed over the course of our evolution to help us distinguish between 'real' and 'unreal' situations. As such, being able to sense presence may be considered a survival mechanism, and in the earliest evolutionary form of our proto-consciousness, "presence was the sense that something was happening outside the organism in the here and now, something that could affect the organism, as opposed to being part of the organism" (Riva et al. 2004: 417). Riva et al. describe how eventually (both in evolutionary and neurological terms), sensation led to perception and presence emerged "as the feeling (in core consciousness) of being in an external, perceptible world in which things happen in relation to the organism" (ibid.). Later still, the internal modelling of our extended consciousness directed our attention towards "non-present, imagined worlds, experienced as being outside the organism (specially in the head). To be useful in assessing possible scenarios, presumably their main evolutionary purpose, the imagined events that were used evoked similar emotional response to those that external events would, but not the same feeling of presence." (ibid.)

Descriptive problems

I have already pointed towards the difficulties related to the heterogeneity of vocabularies used within the broad and interdisciplinary fields of presence research and presence design. One of the lingering questions about mediated spaces concerns how we may refer to the remote location. Figs. A, B, and C illustrate different juxtapositions of real and virtual space in the form of *spatial montage* which may be referred to as a *mediated space*.[47] In Fig. A, the representation of a remote real space has been projected onto a wall: this is *virtual space*. Although in different locations, each party occupies a real space and looks into a virtual space. In the computer-generated environment displayed on the wall of Fig. C, we notice avatars in the remote space, but from this observer's perspective, this is nevertheless a combination of virtual and real space. The remote party can be said to interact across (at least) three spaces: (1) a real space, from which s/he monitors a computer interface which

[46] Researchers at the Department of Neurology at the University of Iowa and the Salk Institute in La Jolla, California, US.

[47] An alternative term is *mixed-reality architecture*, see Schnädelbach (2007).

establishes (2) a virtual space (e.g. Second Life) into which (3) the interior of the remote location is imported via a web-cam.

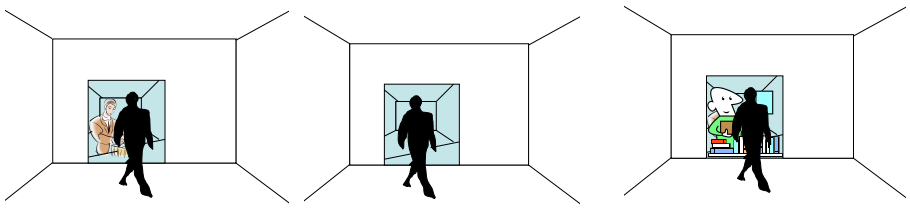


Fig A Fig B Fig C

28. *Fig. A illustrates a real space which includes a representation of another location, displayed on a wall and thus evoking a 'virtual space'. When both spaces are occupied by people who interact with each other in real-time, we may speak of synchronous and shared mediated spaces or of mediated architectural extensions. In Fig. B there is no one in the remote location. Unless the remote space is occupied, we cannot know it exists in real-time. It may be a photo. We still find ourselves in a mediated space – but we cannot easily address the notion of presence, since the necessary 'reality check' is difficult to carry out (cf. IJsselsteijn 2004). In Fig. C a real space is extended to a virtual environment on 'Second Life'. In this case, the remote location is occupied by an avatar. The response from the avatar will help us determine if the mediated interaction occurs in real-time.*

A further complexity is illustrated by Fig. B. If no activity can be noticed in the remote location, it is easy to mistake a represented remote space for a photo, rather than interpreting it as an architectural extension in real-time. This may be the case even if movements can be detected. To the human eye, a mediated extension could be interpreted as a feature film. Here, it is obvious that design plays an explicit role: if anything like a computer or TV display can be seen, viewers are, by virtue of habit, quite likely to interpret what they see as a conventional computer, where the presence of a display makes one think: 'I am looking *at* a screen' rather than 'I am looking *through* a window', or '*out* to a porch'. Nevertheless, even if a display is embedded in the spatial design, a user of mediated spaces must always be convinced that what the eye perceives is to be trusted. In a similar way that mirrors often create visual illusions which displace and disorient users in real spaces, mediated spaces require that we use and inhabit them.[48] When used, we may thus speak of *synchronous mediated spaces* and of *mediated architectural extensions*.

The qualifying feature of synchronous mediated spaces is that mediated interaction in real-time is supported. This can be achieved through different design strategies. In Fig. C, a web-interface and a web-camera support presence. In Fig. A, the audiovisual transmission between the two locations can also be achieved via a web interface (IP) or via a fibre link, telecommunications networks, and it can involve a video codec, although in its simplest version, all that is required is adequate cabling to connect cameras, displays, microphones and loud speakers in the two spaces.[49]

The above figures illustrate a descriptive problem of mediated spaces. To speak of 'real' and 'virtual' space is limiting when, as here, we want to address spatial extensions as they appear in the moment of presence. In a presence situation, users experience a shared space – and this space is neither real nor entirely virtual since all parties involved are fully aware of the materiality of each surrounding space. This concept of *shared mediated space*, I argue, is generated by use.

The discussion above aimed to introduce a conceptual and descriptive problem of mediated spaces – this is a central theme to which I shall return, since my project addresses the need for a revised set of conceptual tools for the design of mediated spaces. My design-led research shows that both users, presence designers (e.g. architects, media technology

[48] I return to the concept of an *active* spectatorship in a later section. This is a theme I explore by discussing the role of spectators in the history of related visual and performing arts. I argue that the convention of *passive* spectator (viewer, consumer) needs to be replaced by an *active* role of spectator, which has implications also for architecture.

[49] For simplicity, I only refer to one remote location in this example. Later I will refer to the complexity in addressing extended spaces when three or more locations are involved.

engineers, technicians) often lack adequate conceptual tools to address the spatial qualities at hand.

A major concern for presence design, I argue, is the role of gaze and mutual gaze in human interaction (Argyle & Cook 1976), which was observed early in the first mediated spaces at Xerox EuroPARC (Heath et al. 1995; Heath & Luff 1992). Studies of video-conferencing have shown that when mutual gaze is not possible, conversation is reduced and people are less likely to talk and share their views (Vertegaal & Ding 2002). However, such research appears to have had limited influence on the parallel development of presence technologies. To date, there are few commercially available products which enable mutual gaze and incorporate spatial design considerations immanent to related design practices, such as architecture, film, and theatre.

Five interwoven themes

Architects, by tradition, design real spaces and material artefacts to support human practices. Increasingly, however, architects are drawn into the realm of digital, immaterial or hybrid design contexts. A new challenge can be approached in several different ways. One may, for example, apply the same design criteria to virtual spaces as to real spaces, allowing the virtual to be modelled on the real. Or one could explore the design potentials which arise when, for example, the laws of gravity and the needs for climatic protection can be completely ignored. Then again, an architect could resist the challenge of the virtual, perhaps not altogether, but to some extent, by claiming that architecture is solely based on the material, thereby handing such commissions over to professionals from other fields.

Regardless of which route is taken, an architect today faces users who will, for both work and leisure, move between real and virtual spaces throughout their day. Furthermore, anyone who uses and experiences spaces – whether real or virtual – will always do so *from inside a real space*. This assertion, that 'virtual space' can only be accessed from a 'real space' presents a new situation for architects, who by convention and tradition are responsible for the design of 'real places'. It is the spatial design of such *liminality* (liminal, hybrid spaces) which concerns me here, and their hybrid nature leads me to argue that mediated spaces are a concern for architectural design.

Whereas other researchers have explored the extent to which we, as humans, can immerse ourselves in virtual worlds, thus addressing the conditions for virtual design when we are freed from our bodily positions, the object here is to understand how mingling and dialogic interaction can be supported by both real and virtual spaces.

My focus is how architecture and spatial design facilitates human interaction across both real and virtual spaces, and to address new spatial concepts which emerge in the discourse about liminal or hybrid spaces. To me, presence design is an architectural design concern. However, our current terminology and conceptual toolbox suggests that there are different kinds of space; this establishes a form of dualism or polarisation that forces us to relate to the real and the virtual as if they were in opposition to one another. This thesis proposes the elimination of the prevailing distinctions between 'virtual space' and 'real space'. It will be argued here that the polarised approach must be dismantled in order for us to understand – and therefore to address the aesthetic qualities, and consequently to design – the hybrid spatiality across which we meet in video-mediated contexts. Mediated spaces allow us to interact and carry out collaborative work in real time, in spite of the fact that our bodies are geographically distributed (at times separated by vast oceans), thus sometimes also providing viable alternatives to travel. These conditions, which effectively allow us to be present in several locations at once, are here referred to as architectural extensions and mediated spaces: hybrid artefacts of presence design.

By incorporating the concepts of virtual, mediated and hybrid space into the realm of architecture, I suggest that architectural practice may be extended, through the involvement of architects in new cross-disciplinary collaborations. I test the applicability of a 'conceptual toolbox' by applying selected spatial concepts from architecture and adjacent practices to

different presence design examples. Thus, I use the tools of the designer (e.g. drafting, prototyping, visual/textual/spatial forms of montage*)* coupled with the tools of architectural theory (e.g. critique, forms of critical writing and reflection) to explore the liminal thresholds of architecture as a discipline, observing its integration with other media.

On the other hand, this thesis outlines presence design as a transdisciplinary aesthetic practice and discusses the contribution of architects to a currently diversified research field, which ranges over media space research, cognitive science, (tele)presence research, interaction design, ubiquitous computing, second-order cybernetics, computer-supported collaborative work, but where artistic practices, to date, are less represented. By this account, this thesis can be said to focus on how a combination of spatial and technical design may support presence and video-mediated interaction: Whilst bringing several areas of research together, I strive to inform transdisciplinary practices, such as presence design.

These two quite different perspectives serve my dual address to both architecture and the fields of media and communications. Furthermore, they provide the means to address five interwoven themes throughout this thesis:

(1) There is an over-emphasis on the material as a single referent to the real within architecture, both architectural discourse and practice. Architects sometimes behave as if space is a concept outside time, as if space is a whole (complete, sufficient) concept in itself. Time, however, introduces the spatial experience and cannot be separated from space. Triggered by the notion of presence in shared mediated environments, the spatio-temporal aspect of architecture is implicit and therefore will be addressed more directly.
(2) The centrality of users is frequently neglected in architecture (here addressed in terms of an active spectatorship).
(3) Architecture and presence design can support knowledge-sharing and mediated interaction far better than it sometimes does.
(4) The definition of architecture may be expanded to include immaterial virtual spaces, thus providing an expanded (composite, enriched, extended) spatial concept based on a juxtaposition of space(s) and presence design.
(5) The above may have an impact on the future of workplace design and the design of spaces where dialogic interaction and knowledge sharing is a crucial concern.

Spatial confusion

Several critics have claimed that high cost and inferior interface have hampered the development and implementation of presence technologies. The cost of equipment has, however, dropped dramatically in recent years. In spite of significant advances within human-computer interaction and interaction design that serve to provide smoother links between humans and machines, the perceived changes are small and still do not meet user expectations. I believe both the problems – and the potential solutions – lie beyond the issues of cost and user-friendliness. We are not dealing with solely a human-machine interface, or a human-computer interface – but rather with humans who interact in real time inside real spaces, yet across space. These real spaces were designed for specific practices and serve to support dialogic interaction. One may perhaps say that we are currently dealing with existing 'aesthetic practices' in new 'composite spaces'. The result – from both a user and a designer perspective – is spatial confusion. I argue that these are spatial design related issues which cannot be left unaddressed in today's work and learning environments.

My thesis may thus be seen as an attempt to resolve some of this confusion. I employ the following strategies:

(1) putting forward a conceptual toolbox that I suggest may fruitfully be applied to presence design;

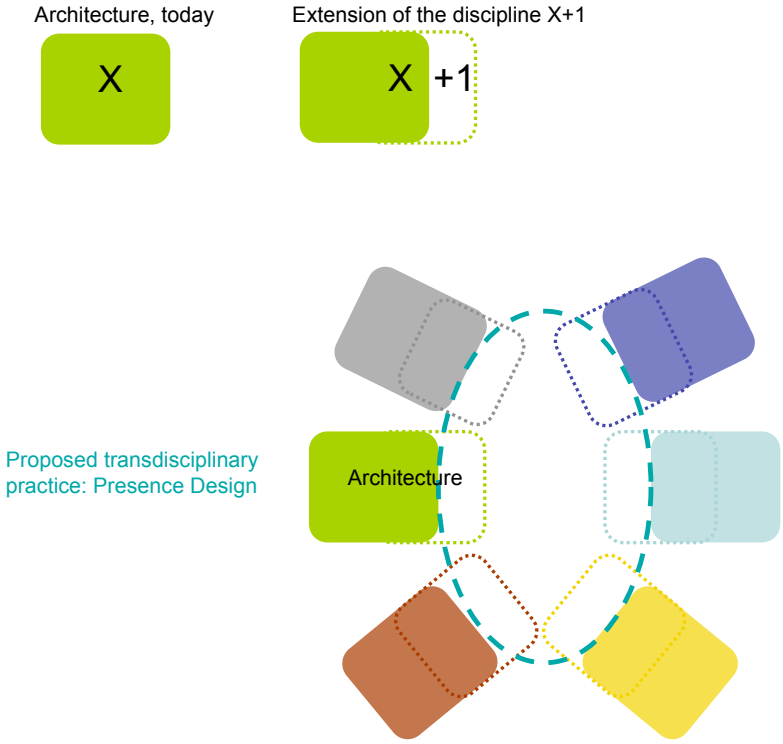
(2) proposing a more inclusive/composite concept of space, which includes both the 'virtual' and the 'real'; and

(3) drawing the outline of presence design as a transdisciplinary practice.

My contribution to sustainable design and sustainable development is, therefore, to stress the importance of design in guiding, enabling or hampering human behaviour. The role of design in supporting human interaction in real spaces has been widely addressed. Here, the discussion is extended: What can architects contribute to the design for mediated interaction and knowledge sharing?

In connection to this, I suggest that a descriptive problem must also be resolved. Each of the many disciplines which relate to presence research – including the producers of presence technologies, cognition scientists and interaction designers – currently feel they alone 'own the problem'. I propose, therefore, that discourse on the subject has been separated by disciplinary boundaries, which has resulted in conceptual heterogeneity and gaps. I have identified a lack of aesthetic concepts, immanent to architecture and related visual and artistic practices. One example is that spatial design concepts have been omitted from the equation. Presently – for reasons that I outline here – architecture and spatial design do not sufficiently inform research and development within presence research and the development of presence technologies.

My attempt, therefore, is to discuss presence design as a transdisciplinary practice for which spatial concepts are also crucial, which is why I argue that an extended architectural discipline ought to contribute to presence design, along with other research disciplines. A general aim is thus to outline such an aesthetic practice and discuss its potential in relation to an extended architectural practice 'X+1'.



29. A proposed extended architectural discipline X+1 and the transdisciplinary practice of Presence Design.

Does the term 'presence design' too strongly favour 'design' on behalf of something else? My choice of terminology can be seen in contrast to 'presence technologies' or 'presence production' (Knudsen 2004), which I suggest fail to address spatial design considerations. Applying Wittgenstein's concept of *rule-following* to the fields of presence research, architecture and design, I will therefore seek to outline presence design as an *aesthetic practice*

and to articulate some of the 'rules' to which we – presence designers from different fields – conform.[50] I will also present some concepts which I regard as useful for presence design.

The spatial dimensions of video-mediated environments have previously been observed, but primarily outside of architectural discourse and practice, and more often with the aim to improve usability and collaborative media tools, rather than to inform spatial design.[51] Within architectural research, the reverse prevails: media is most often perceived as a tool to facilitate building design processes.[52] Other approaches to media can also be found. Scholars have observed how new media are reflected in architectural development.[53] Increasingly, generative design strategies, which incorporate media and communications technologies, are applied to architectural design.[54]

However, there have been relatively few studies which attempt to incorporate such immaterial spatial artefacts, as result from synchronous video-mediated design contexts, into an expanded definition of architecture. The design of synchronous video-mediated spaces as a means of executing presence design is seldom considered a concern for architects. This, I suggest, is surprising, considering the crucial involvement of numerous architects in a cultural development that I trace back to a few creative milieus of the 1960s and from which concepts such as 'media space' and 'performative design' originate.

In retrospect, it may be considered a missed chance, of concern mainly for architects, but I argue that everyday practices are also affected – or rather, not sufficiently affected. In spite of significant contributions from presence research, interaction design and related product development, today's work environments are not as mediated as one could expect, considering that audiovisual presence technologies have been available for over thirty years. Work patterns have changed, for example, in terms of how we use telephones and computers, however, very little has happened in terms of office design. Today's workplaces are relics of a previous paradigm.

In 2010, web-based meeting software and collaborative tools are available on a wide scale via various computer and telephone interfaces. Communication networks currently make it possible for us to meet and work from almost anywhere. These developments establish virtual spaces across laptop and telephone interfaces but have not affected the design of the workplace. The multiple virtual spaces we enter and leave throughout a workday are referred to as *tools*, or as a means to an end: media, but not spaces. The virtual spaces are perceived as media, not as architectural extensions or spatial workplace designs. But why, I ask? To answer this, I have included a history of presence design here, which comprises my survey of the research and observations of developments in media space research and ubiquitous computing of the last thirty years. I conclude that the current focus on 'space as a tool' has taken shape because of a prevailing view of 'space as an architectural concern'. In the design of 'virtual spaces' less consideration has been given to the surrounding 'real spaces' and the relation between the two. The result, I claim, can be described as a 'spatial clash' between the virtual and the real, notably in the context of workplace design. This clash may not be noticeable to everyone, because after all, the office is still usable. But whereas the emerging virtual spaces serve the current paradigm of work, I argue that the real space, have become less and less functional and the combination of the two – mediated spaces – are seldom addressed as a design issue.

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[50] See 'aesthetic practices' as interpreted by e.g. Johannessen 2004; and Nordenstam 2007.

[51] E.g. Jacucci 2004; Jacucci & Wagner 2005; Baecker et al. 2008; Ciolfi & Bannon 2005; Rossitto 2009; Ehn et al. 2007.

[52] E.g. the development of CAD/CAM (computer aided design)

[53] E.g. Beatriz Colomina's 1994 study of architecture as mass media demonstrates that Le Corbusier's views were founded in cinematic thinking. Cf. Colomina's more recent study in Vidler (ed) 2008: 58ff. Of interest is also Malin Zimm (2005), who discusses the influence from 18th century media culture on architecture, by exploring concepts of spatiality and narrativity relating to emerging moving image technologies.

[54] Cf. Professor Stephen Gage's Bartlett Interactive Architecture Workshop (Gage 2007b), who treats architecture as part of a performative system; Professor Neil Spiller's AVATAR research group (Advanced Virtual and Technological Architecture Research) at the Bartlett UC; or at the AA New Media Initiative. See also the work of Usman Haque 2007; and Pablo Miranda Carranza 2007.

I believe there is a need today to resolve this spatial clash. And I believe architects can contribute to a greater extent than they currently are. I have described it as if architects today are standing on a threshold, just about to engage in the reformulation of their discipline triggered by the development of media and communications within the expanding network society. This is noticeable, not the least in workplace design, from where I take many examples and where my practice-based research is grounded. Space, I argue, cannot be understood merely as a tool. As such, we can only approach its most basic functions, and we will never address significant aesthetic spatial qualities. I claim that hybrid artefacts – the combined material and immaterial – which emerge from new design contexts must be treated as aesthetic concepts. In designing for presence, I propose that we need to look upon the different spatial entities as components which may constitute a whole, or 'tertium quid' using Eisenstein's concept. It is only by approaching the task of designing a collage of virtual and real spatial components that a new spatial aesthetic in workplace design may emerge. My aim here is to establish that research and research through design of mediated spaces, or presence design, can also take place within the field of architecture.

In my exploration of previous attempts to combine and juxtapose 'virtual' and 'real' space, I initially assumed that a lack in spatial design considerations could be explained by an absence of architects in this development. It would have provided an easy explanation, I thought. I was soon to discover that architects, in fact, were seminal to the formation of media space design and research, several decades ago. Moreover, there are several, if not many, examples of architects, designers and researchers who have continued to explore the threshold of the virtual worlds, and still do. The need to reformulate my task was obvious and has allowed me focus more on how the future architectural contribution to presence design ought best to be formulated. After all, my endeavour is not about the (mono)disciplinarity of architecture, but rather, how our skill could benefit the larger whole, e.g. that of collaborative work practices, interaction and knowledge sharing. What is *to work*, really? The answer to that question is immanent to what it is *to go to* work, *to be at* work, to be *in a workplace* – or, not actually there, but still *at work*. Workplace design is bound to be affected, in the end, and I argue that architects are, too. Architects are increasingly exposed to new collaborations, and after all, the principal designers of workplace environments are already working in mediated spaces, which are themselves in need of design. Distributed (work and learning) practices, for which dialogic interaction is crucial, could, I believe, benefit much more from the skills that architects can contribute than is the case today. I suggest that in the current era of digitalization, there is both a need and a possibility to reformulate the contribution of architects.

With this in mind, I approach related visual and performative practices to seek out helpful theoretical concepts (Chapter 3). In my analysis of design examples (Chapters 4-7), I test these as well as existing concepts in architectural discourse and design, applying them to media space designs as well as to my own, more recent attempts to design mediated windows, walls and spaces. Thus, by addressing mediated spaces as architecture and, furthermore, by approaching the subject from a performative design perspective, I propose an extended definition of architecture which incorporates mediated spaces.

Performative design strategies

Performance perspectives have previously been applied to the field of mediated spaces and 'mixed-media environments', for example with a focus on the temporal aspects of interaction, using the concept of an 'event' to discuss how spaces and situations may be 'staged' (e.g. Jacucci & Wagner 2005; Jacucci 2004); stressing that users much engage in a form of 'embodied interaction' to create, manipulate and share meaning (Dourish 2004). In terms of performance, these studies, like my own, refer to works from the 1960s by, for example, Eugenio Barba (2002; 1991), Allan Kaprow (1966), Jerzy Grotowski (1968) and Erving Goffman (1959; 1974).

The performance approach has allowed scholars to address the temporal in combination with the experiential.

Some recent studies combine the notion of a 'performative use of space' with an 'experiential perspective' using the concept of 'place' provided by the humanistic geographer Yi-Fu Tuan (1977), stressing that humans turn 'spaces' into 'places' by physically sensing, exploring and inhabiting them (Fitzpatrick 2003; Ciolfi 2004; Ciolfi & Bannon 2005).

All of these studies are valuable in that they stress that synchronous mediated spaces must be inhabited, experienced and used. They also frequently address the space in which an interaction occurs as a tool or a medium per se. There is a clear focus on the event and its purpose (e.g. learning) as well as on the interaction between participants, an approach in which space becomes a tool for a desired outcome. Thus space is considered an integral part of media, and by consequence, it appears unproblematic to incorporate 'real' and 'virtual' space into concepts such as 'mixed-media' and 'mixed-reality' to research which focuses interaction or media. This, however, does not make these studies entirely applicable to architecture, or replace the need to address the concept from an architectural perspective. In spite of their significant contributions to address space as media, these studies, which are rooted in human-computer interaction and interaction design, will not do the reverse: they cannot regard media as architecture.

Whereas previous studies applied a performance perspective to the mediated interaction, my contribution is to apply a performance perspective to spaces: to address the *spaces as performed*. A distinguishing feature of mediated spaces (in comparison with real spaces and conventional, 'static' architecture) is that in order to support presence, mediated spaces must be 'performed' or 'generated' through a process which includes audiovisual communication technology.[55] It is from such a combination of technical and spatial design that mediated spaces are generated: remote real spaces are reproduced, then juxtaposed with real spaces.

My approach, therefore, to address presence design and mediated spaces 'as performed', is to apply the concept of 'performative' (or 'generative') design action as derived from second-order cybernetics. Applied to architectural design, the cybernetic approach allows me to address spatial representation and modes of interaction as simultaneously generated. The close links between cybernetics and design were explored by Gordon Pask, whose conversation theory (1969) forms the basis for the architect and cybernetic theorist Runolph Glanville's later exploration of *designing as a form of conversation* which involves listening and talking in an essentially circular fashion (2007a). The *circular,* as a distinctive feature of cybernetic systems, allows Glanville to discuss designing as a continuous process comparable to autopoietic systems, which generate and maintain themselves within an environment. The context of design thus merges with the context of use. This provides a point of departure for my reading of mediated spaces, an approach which differs from what is customary in research, where the design process, the outcome of artefacts and their use are often distinguished from one another. As with performances, which presuppose a simultaneity of design action and experience – of representation and presence – mediated spaces must be inhabited in order to exist. As proposed by John Dewey, this may be discussed in terms of the structural relationship between 'doing and undergoing' (Dewey 1934; 1980). The mere appearance of, for example, a mediated wall in a space is not enough to address its mediated spatiality because, as noted by Ehn et al., a performative artefact "does not unleash its communicative potential by just being observed and scrutinized, but a participant must interact with it activating the playing of digital media" (Ehn et al. 2007: 65).

I show that architects played a crucial role in the initial formation of the creative research milieus of the 1960s, where and when the technical foundations for mediated spaces were laid.

A number of architects were equally involved in cybernetics in the 1960s, a field which even then provided the possibility to address mediated spaces and design. Second-order

[55] Holger Schnädelbach writes that "architecture, while having a clear structuring effect on co-presence as the pre-condition for social interaction, is very static and inflexible" (2007).

cybernetics has since developed in several different directions, both within and without the fields of architecture and design. But cybernetic thinking has (to my knowledge) not been applied to the notion of presence design discussed here: to synchronous and shared mediated spaces. I believe this provides a fruitful conceptual framework to distinguish synchronous spaces from other mediated spaces (e.g. one-way or asynchronous), which allows me to pinpoint some spatial design considerations regarding 'presence design'.

Second-order cybernetics has been compared to recent post-structuralist practices, for which the concept of architecture is constructed out of the different contingent relations between human agents, social processes, interaction, modes of representation, materials, technologies and the built artefact (Rawes 2007). In tracing the roots of performance, I furthermore search for useful concepts in related visual practices, in order to later discuss the relevance of such concepts to designing for presence today.

A combination of factors that I observe, such as the involvement of architects in the early developments of both ubiquitous computing and cybernetics, and the fact that adequate media technology was available already at the time, allows me to suggest that architects, already by the 1960s and through the 1980s – as part of new interdisciplinary collaborations – faced similar challenges as those we face in presence design today. I discuss some of the technical advances made since the 1980s and place the original concept of 'media space' in today's context, comparing the earliest 'media space' with more recent attempts, including some of my own design-driven and design-led research. Although the Xerox PARC research projects from the 1980s are already well documented, I contribute my own interpretation of this seminal 'media space', which I refer to as an exemplar in presence design, and reflect on it by making comparisons to my own more recent attempts.

In summary, this form of research-through-design provides both a method to approach the material I use, and a form of result. I apply selected spatial concepts (drawn from my study of related visual practices) and discuss their relevance as design tools for 'presence design', aiming to outline this as an interdisciplinary aesthetic practice. In addition to the concepts which I draw from the study of related visual and performing practices – *mediated gaze, spatial montage, frontal versus lateral forms of collaboration, shared mediated space, offscreen space* – I also call for an *active spectatorship* in design (active user in contrast to passive observer or spectator).

Amongst these, I have borrowed the concepts of *spatial montage* and *tertium quid* from the Russian film director and theorist Sergei Eisenstein (see Chapter 7). Eisenstein studied architecture in his early years and his interest in the arts and proficiency in drawing is well documented. For him, *montage* was an architectural concept and a tool for spatial design on a flat screen. His aim in working with new media was to overcome where painting had fallen short: "Only the film camera has solved the problem of doing this on a flat surface, but its undoubted ancestor in this capability is — architecture. The Greeks have left us the most perfect examples of shot design, change of shot, and shot length." (Eisenstein ca. 1938: 112) The concept of montage, for Eisenstein, meant that two or more images edited together could create a 'tertium quid', a third element which constitutes a whole greater than the sum of its individual parts. Eisenstein's concern with space and time, as exposed in several of his films, makes him an exemplary presence designer, to whom I frequently return throughout the text.

In his book *The Language of New Media*, Lev Manovich (2001) used examples from early Russian cinema to demonstrate that Eisenstein's and Dziga Vertov's aesthetics have informed subsequent film practices. Manovich proposed that the concept of 'montage' is applicable also to 'new media' artefacts. My study may be seen as an attempt to test if this is the case. Is 'spatial montage' a useful concept in addressing the combination of material and immaterial artefacts that constitute mediated spaces and audiovisually extended architecture?

My study shows that the involvement of architects in designing (and researching) mediated spaces has been limited since the 1980s, and suggests that architects today could resume this specific line of work. By presenting presence design and mediated spaces as

topics for research in architecture, I invite fellow architects to participate in designing for presence and to include mediated spaces in an extended definition of architecture.

Spatial or social?

I introduced my study as "a contribution to presence research in that it concerns the combination of spatial and technical design to support mediated interaction". This suggestion, however, assumes that mediated spaces can support mediated interaction, a statement which I will try to qualify in this section. Furthermore, the statement addresses the relationship between a *spatial* organisation and its *social* context, a relationship which is of major concern, yet viewed differently by different research disciplines.

My own observations are drawn from an extensive design practice where I have had the opportunity to reflect on how people interact in many different mediated environments. From this experience and my work with design prototypes that have been produced (tested, refined and reworked again and again...), I have concluded that mediated spaces *can* provide adequate support for mediated interaction in a number of contexts. This, however, does not necessarily imply it will always be the case. We have often noticed how a presence situation fails, that a person suddenly is reminded of the limits of a mediated context (perhaps a sudden realization that mutual gaze cannot be effectively achieved, or an annoyance caused by poor acoustics, or a frustration because one party fails to see what is outside the shared visual space, etc.). In such cases, the remote party may even remain unaware of what has unsettled the interaction, but the sense of presence is nevertheless affected, or perhaps even destroyed. We learn as much from these situations of failure as from those which succeed. No more than a real space can ever guarantee an effective flow of communication (e.g. in a workplace) can a mediated space do so. As with real spaces, our aim as designers is to achieve excellence, primarily by meeting users' needs, but as long as human experience is involved, we can never guarantee that a space will work in all user contexts.

My designer observations are supported by the work of several researchers who have previously established that users may experience a sense of presence in specific mediated contexts and that 'media spaces' facilitate collaboration across time and space.[56] Case studies are common and frequently based on comparisons where a task at hand is carried out both in real space and in mediated space. Depending on their focus, researchers have thus been able to assess the users' experience of presence and/or have observed whether a task is carried out as well as, better, or worse than it would have had the users been sharing a real space.

Drawing on such studies, and my own design experience, I have come to understand that under certain conditions mediated spaces enable people to collaborate and to successfully achieve a shared task, or to make agreements. I need perhaps not remind the reader that the aim of my study is *not* to provide further proof of this, but rather to contribute an architectural perspective on the design situations at hand.[57] To do this, however, I need to refer to prior research in several related fields, both in order to establish what is prior knowledge, and to reflect on the many different approaches and methodologies which, to date, dominate presence research. The latter is of utmost importance to my own endeavour, since I wish to contribute an alternative approach to a subject area that is already well observed.

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[56] Twenty years of media space research was recently compiled in Harrison 2009; see also Bly et al. 1993; Dourish & Bly 1993; Harrison and Minneman 1990; Mantei et al. 1991, Stults 1986, Tang et al. 1994. The concept of co-presence in media space research has been studied by e.g. Bly et al. 1993; Gaver et al. 1992. Numerous other studies have been performed in the field of presence research, see e.g.: Barfield & Weghorst 1993; Biocca et al. 2003; Draper et al. 1998; Freeman 2004; Heeter 1992; Lee 2004; Lombard & Ditton, 1997; Mantovani & Riva 1999; Sheridan 1992; Waterworth & Waterworth 2001; Zahorik & Jenison 1998.

[57] Although a large body of my work concerns the importance of mutual gaze in presence design, it is not a specific concern here to assert to which degree mutual gaze promotes the experience of presence. For such measures, I refer to scientists within presence research. For an overview of recent contributions, see ISPRa or IJsselsteijn et al. 2001.

As I mentioned earlier, many detailed yet diverse explications of the concept of presence prevail in this interdisciplinary and acknowledged vast field.[58] In their seminal overview of presence research, Lombard & Ditto conclude that all works reviewed share a core definition of presence as *a perceptual illusion of nonmediation* (1997). Their explanation follows:

> The term "perceptual" indicates that this phenomenon involves continuous (real time) responses of the human sensory, cognitive, and affective processing systems to objects and entities in a person's environment. An 'illusion of nonmediation' occurs when a person fails to perceive or acknowledge the existence of a medium in his/her communication environment and responds as he/she would if the medium were not there. (ibid.)

Stressing that users are always aware that they use a media (medium) and that a media is always involved, they continue:

> The illusion of nonmediation can occur in two distinct ways: (a) the medium can appear to be invisible or transparent and function as would a large open window, with the medium user and the medium content (objects and entities) sharing the same physical environment; and (b) the medium can appear to be transformed into something other than a medium, a social entity. (ibid.)[59]

Lombard & Ditton further stress that the experience of presence

> …does not occur in degrees but either does or does not occur at any instant during media use; the subjective feeling that a medium or media-use experience produces a greater or lesser sense of presence is attributable to there being a greater or lesser number of instants during the experience in which the illusion of nonmediation occurs. (ibid.)

Presence research can thus be said to address the relationship between spatial and social, with an emphasis on determining the conditions that facilitate the (social) experience of presence in (social) mediated contexts.

In contrast, 'media space research' is not concerned with the concept of 'presence'. The term is hardly found in literature from this field and as previously suggested, media space research considers space a tool amongst others which may facilitate collaboration.

Sociologists, in turn, tend to prioritize the social organisation of human activity. Social network analysis is a methodology to study social relations, and provides tools to detect and map structures of social interaction, also when interaction occurs in virtual space. Network analysts claim that to gain fundamental insights about an organisation one must observe the ties that connect, for example, the employees in a firm. Here one may contrast informal, non-regulated ties with the formal ties provided by the hierarchy of the organisation. Mapping such ties among employees, network analysts are able to capture a social structure of, for example, a firm, which by necessity differs from the organisational charts (Edling 2009). Physical space does generally not play a significant role in social network analysis, the objective of which is "rather to demonstrate that there are other, more significant structures than spatial location that explains social behaviour" (ibid.).

Some studies however indicate that social networks are spatially constrained. Physical space may not determine, but will nevertheless interact with social space in order to affect human behaviour. The so-called 'broken window hypothesis' provides evidence that worn-down urban spaces promote anti-social behaviour (e.g. Keizer et al. 2008), and it has been shown that people interact more frequently with people within closer physical distance

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[58] While I frequently use the term 'presence research' as an umbrella for all research which concerns presence and mediated spaces throughout this text, I also wish to acknowledge the different foci of '(Tele)Presence research' and 'Media Space research' including various studies performed within the even broader fields of HCI and CSCW. IJsselsteijn et al. 2001 proposed a core bibliography of presence research consisting of 85 works, while Lombard and Jones (2007) contributed a list of over 1800 scholarly publications.

[59] Lombard & Ditton's term can be compared to *immediacy*, a term chosen by media theorists Bolter & Grusin (2000) to characterize a process of *remediation* in which the new medium used becomes transparent (allowing the observer to forget that the experience is mediated); in contrast to *hypermediacy* which makes the media explicit and obvious.

(Festinger et al. 1950; Fisher 1982). The explanation from sociologists is that some ties are cheaper to maintain, and that overcoming a distance is usually associated with a cost of some kind (Edling 2009). In this respect, online communication and virtual communities have dramatically reduced costs, which means that spatial proximity becomes a less salient factor, in terms of tie formation and maintenance (Wellman 2001). In terms of my own topic, it is interesting that social network analysis provides a methodology to map relationships beyond the physical constraints of, for example, an office. A deeper focus concerning the role of space in social network analysis, such as proposed by Christopher Edling (2009) would therefore be fruitful to presence design since it offers the means to transgress real, virtual and mediated spaces.

Architectural research methodologies, in general, and more specifically space syntax theory, I argue, currently suffer from precisely this lack and incapacity of incorporating the virtual and mediated spaces which are increasingly seminal to contemporary work practices.

Within architectural research, case studies indicate that proximity and visibility are important factors that influence social interaction in work contexts (Steen 2009). However, the methodologies used to observe the interplay between spatial configuration and social behaviour in work contexts will only assess human interaction within the workplace (e.g. its different physical premises), which means that other data, arguably of increasing importance (e.g. telephone conversations, video-mediated interaction, online meetings etc.) go amiss.[60]

In spite of many important contributions within space syntax theory that assess and define the influence of spatial settings on organisational outcomes (e.g. Hillier 1996; Heerwagen et al. 2004; Penn et al. 1999; Peponis et al. 2007; Toker & Gray 2008) few consolidated findings exist. Ss pointed out by Kerstin Sailer, there is little accordance among scholars from different disciplines on exactly how the relationship between space and organisation is constituted (Sailer 2007; 2010; Sailer & Penn 2009). Sailer explains the inconsistency of studies from the 1970s by noting the significant differences in measuring variables, methodologies and terminology used to describe physical settings (e.g. the concept of an open plan office varies widely). Research stagnated during the 1980s, only to increase along the so-called 'spatial turn' within the social sciences in the 1990s (Massey 1998; Soja 1996), but discourse on the subject is nevertheless separated along the lines of disciplinary boundaries.

Seminal texts within space syntax theory present spatial configuration as a generic function, stating:

> …to occupy space means to be aware of the relationships of space to others, that to occupy a building means to move about in it, and to move about in a building depends on being able to retain an intelligible picture of it. Intelligibility and functionality defined as formal properties of spatial complexes are the key 'generic functions', and as such the key structures which restrict the field of combinatorial possibility and give rise to the architecturally real. (Hillier 1996: 282)

The same text states that the spatial configuration will have an effect on who we encounter and who we avoid, by way of defining certain patterns of co-presence and co-awareness among the individuals who share a space. In their early and formative text, 'The Social Logic of Space', Bill Hillier and Julienne Hanson explained the intricate way in which space and organisation relate by introducing the concept of 'spatiality' and 'transpatiality' (1984). They argued that the relations between individuals generally can be explained either as a spatial function or as a social function of conceptual closeness (i.e. transpatiality):

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[60] Within space syntax theory the analysis of visibility in architectural configurations is a tool for understanding the space-organisation relationship, and specifically how human behaviour is affected by a spatial organisation (see e.g. Benedikt 1979; Turner & Penn 1999). Steen (2009) reports space syntax studies which observe how workers interact face-to-face, using mail, and telephone respectively. To date, space syntax theory is restricted to the analysis of human interaction in real spaces. For an initial attempt to adapt space syntax methodology to interactions in virtual space, see Schnädelbach (2009).

> The inhabitant of a house in a village, say, is related to his neighbours spatially, in that he occupies a location in relation to them, but also he relates to them conceptually, in that his interior system of spatialised categories is similar or different from those of his neighbours. He relates, it might be said, transpatially as well as spatially. (ibid.: 18f)

Presenting an alternative to time-consuming in-depth case studies, Sailer & Penn (2009) propose that further explorations be undertaken to understand how this interplay is governed, as a *generic function* on the one hand and in terms of *spatiality/transpatiality* on the other – in order to inform workplace design practices. By bringing together several areas of research, I hope this thesis may be interpreted as such an attempt, and that although my strategies differ from space syntax theory, my analysis of virtual and mediated spaces may inform existing research methodologies relating to architectural design.

'Space' or 'place'?

The distinction between 'place' and 'space' is well debated. Michel de Certeau inserts the dimension of time into the definition of space:

> A space exists when one takes into consideration vectors of direction, velocities, and time variables. Thus space is composed of intersections of mobile elements. It is in a sense actuated by the ensemble of movements within it. Space occurs as the effect produced by the operations that orient it, situate it, temporalize it, and make it function in a polyvalent unity of conflictual programs or contractual proximities. (1984: 117)

The concept of 'place' as linked to the human experience and use is derived from human geography and inspired by phenomenology (Relph 1981; Tuan 1977). Whereas a 'space' denotes abstract geometrical extension and location, a 'place' describes the experience of being in the world and instantiates a physical location with meaning, memories and emotion "…incarnat[ing] the experience and aspirations of people" (Tuan: 281).

This understanding has informed Harrison and Dourish, who argue that a place is a portion of space and have suggested that media spaces can become places, being not just a physical container for individuals and their tasks, but a location (physical or virtual) where complex social interactions may occur (1996): "Place is a space which is invested with understandings of behavioural appropriateness, cultural expectations and so forth. We are located in 'space' but we act in 'place.'" (ibid.) When people share an enriched portion of space and use language to talk about their experience, they transform a space into a place.

Other related research

The spatial dimension of video-mediated environments has previously been addressed within the fields of human-computer interaction (HCI) and computer-supported collaborative work (CSCW). These research areas (more recently grouped under the label of interaction design), can be traced back to the 1960's and to a few creative research milieus – notably Xerox PARC and the MIT Media Lab –focused on ubiquitous and tangible computing. Their research was prompted in response to the need for tools and user-centred product design that supported collaboration between people who, for example, worked in different locations (Dourish 2004).

Spatial design is often addressed within HCI, CSCW and interaction design, but more often the aim is to improve usability or the design of collaborative tools,[61] rather than to design work environments.

As pointed out by Giulio Jacucci, research within ubiquitous and tangible computing was not directly aimed at informing "the design of physical interfaces (e.g., addressing distributed systems or virtual environments)", but has nevertheless contributed to the current understanding of these aspects within HCI and CSCW (2004: 21). Research within HCI has

[61] See for example Jacucci 2004; Jacucci & Wagner 2005; Ciolfo & Bannon 2005; Baecker et al. 2008, Rossitto 2009; Ehn et al. 2007

traditionally distinguished between 'user', 'tool' and 'task' in its attempt to evaluate the usability of products. If a tool facilitates a task without exceeding the capabilities of the user, the product or service may be regarded usable, a good fit for the user. It has been noted that this approach reflects a reductive view of the user, and a more holistic approach has been called for, in which users are understood as human beings with value systems (Jordan 2003: 7).

To a limited extent, the spatial dimension of mediated environments is noted within presence research, a field primarily concerned with the cognitive and technical aspects of distributed collaboration.[62]

Interaction design researchers such as Pelle Ehn, Giorgio de Michelis, Ina Wagner and others use terms such as 'configuration of mixed objects' and 'appropriation of mixed places' in their aim to inform "the design of architecture and technology for inspirational learning environments" (Ehn et al. 2007: 51). Relating to the fields of ubiquitous and tangible computing, as well as HCI, they seek "a new stance for understanding of both social and physical interaction with artefacts and space" (ibid.). Their position is that all interaction with artefacts is experiential and that, therefore, it is impossible to define an artefact as entirely digital: "The design materials for digital artefacts are both spatial and temporal (...) almost any material can be of use in the spatial configuration." (ibid.: 66) Along the same lines, other interaction designers stress that:

> "…all man-made objects offer the possibility for interaction, and all design activities can be viewed as designed for interaction. The same is true not only for objects but also of spaces, messages, and systems. Interaction is a key aspect of function, and function is a key aspect of design." (Dubberly et al. 2009: 69)

Tracing the conceptual development of performance art to cubism and action collage, Giulio Jacucci applies Kaprow's concept of 'assemblage' to digital objects and physical artefacts' in discussing "the emergence of physical interfaces that support interaction (input and output interfaces) in space and artefacts" (Jacucci 2004: 15). Jacucci and Wagner (2005: 212) note that when physical interfaces merge into the realm of space and artefacts, it becomes problematic to discuss the environment in terms of being a tool.

Pelle Ehn has noted that "in designing computer artefacts as tools we must investigate both constraints and new possibilities for acquisition of tacit knowledge based on sensuous experience." (1988: 451) From the above one may reflect that despite significant attempts within HCI, CSCW, interaction design and presence research to address spatial dimensions, very little appears to have impacted architectural design.

A limited influence on the development of office design should be noted (e.g. Duffy 1997, a field which is curiously distinguished from CSCW, and in particular, from the application of space syntax theory (Hillier & Hanson 1984; Hillier 1996).

Within architectural theory, I have outlined a few attempts to observe the effect of media in its capacity to create architectural extensions across time and space. Some of these stem from performative (or 'generative') design and theory relating to second-order cybernetics. A leading practitioner today is Usman Haque, whose design-driven research is a good, yet rare, example of the intermingling of disciplines which has been going on in small groups since the work of Gordon Pask began more than forty years ago. In a recent article, Haque provides a fruitful definition that has relevance to my discussion here. Reflecting on the common use of the term 'interactive' in relation to architecture and design, Haque comments it currently refers to "anything generally" reactive or responsive. Haque instead calls for a

[62] Cf. e.g. Knudsen (2004: 56) and Lombard & Ditton (1997), who state that "[P]resence should be enhanced when our body is moved in physical space during a mediated experience" but do not explore this further. Questionnaire-base studies are, however, frequently used to report the level to which remote participants agree with statements such as "[It felt] as if we were all in the same room" and "[It felt] like a real face-to-face meeting", such as by e.g. Muhlbach et al. (1995: 301) who defined "telepresence in video communications" as "the degree to which participants of a telemeeting get the impression of sharing space with interlocutors who are at a remote physical site".

return to its original understanding within second-order cybernetics: "Originally, interaction was distinguished from circular 'mutual reaction': it was about affecting not just actual output (in response to input) but also about affecting the way that output is calculated." (Haque 2007: 26) His understanding of his role as designer, in consequence, is to leave both input and output criteria 'underspecified' and to ensure that instead "they are actively and iteratively constructed by other participants of the project, and a more productive relationship ensues between human and environment. (...) It is this constructional notion that is lost when we are content to call interactive those things that are merely reactive."(ibid.: 27) The above is well illustrated by Haque's own work but also noticeable in the work of architect/designers such as Michael Fox, Pablo Miranda, Adam Somlai-Fischer, Jim Campbell, KRETS design group, among others.

The impact of digitization has had on aesthetic practices is a long-standing debate. Initially triggered by Norbert Wiener's foundational texts on cybernetic theory and the correlation between computers and the human nervous system (1948), the significance of an 'art-technology symbiosis' which dissolves old boundaries is a recurrent theme in art and architecture discourse of the 1960s (Burnham 1968; 1973).

In 1965, media theorist Marshall McLuhan anticipated a dematerialized society supported by communications technology (1964). Joseph Weizenbaum's computer program 'Eliza', which enabled dialogic interaction with a computerized psychotherapist was presented in 1966 (Weizenbaum 1966). From Eliza followed a critical discussion on what computers can and cannot do, which was in turn followed by the emerging field of 'Artificial Intelligence' (Dreyfus 1972; 1993). Cybernetics developed as an interdisciplinary discipline in the 1940s and its subsequent concepts of information flow, feedback loops, adaptation learning and self-organization have been influential across many practices (Ascott 1999; Price et al. 2003: 69). In architectural design, the impact of computers and the logic of information systems can be seen throughout the 1960s, for example, as expressed through the architectural practices of Archigram, Cedric Price, Frei Otto, Kenzo Tange, Kisho Kurokawa, Arata Isozaki among others.[63]

My concern here, however, is not how computers facilitate architectural representation or how communication technology may support a design process. Neither will I discuss the general impact of these technologies on the architectural or artistic expression; or how computer and communication technology serves the design and monitoring of 'intelligent buildings' and 'smart homes' (Junestrand 2004).

Any space that includes digital media or communication technology may be referred to as mediated, but (to remind the reader) it is audiovisual communication technology (computers are not necessarily involved) that enables synchronous reproduction of space, and its application to architecture, which is our concern here (presence design). For this reason, we will look more closely at a few design-driven research environments which were rooted in the cybernetic culture of the 1960s (see Chapter 3, section titled 'Interactive architecture in its cybernetic setting). My focus lies in the way that cybernetics led generative design strategies, and the fact that several of the pioneers of cybernetic design expressed a genuine interest in how the combination of architecture, design and new technology could support of dialogic interaction between people. As we will observe, the interest in architecture and the close collaboration between architects and engineers is of major importance to the emergence of cybernetic design. Several architects were influential in the initial formation of the research labs which have dominated the development and design of video-mediated communications.

Since architects were involved at this early stage of development and since the design problems were often related to the issue of synchronous spaces, it is curious to note that the

[63] Designs need not always be executed in built form, yet play a significant role in architectural discourse (e.g. Kisho Kurokawa's 'Capsule declaration' from 1969, his 'Capsule House', 1970; Kenzo Tange's proposed Tokyo city plan,1970; or Archigram's 'hardware-software dichotomy' as expressed in the projects 'Plug-in City' and 'Computer City' etc.).

subsequent and more recent development in presence research appears detached from architectural practice. To understand this turn of evens, I shall observe parallel developments in the visual arts' and in the research and development of presence technologies and telecommunication during the 1960s.

Although much of the development has taken place at the margins of mainstream art, architecture and design, some expressions of second-order cybernetics are noteworthy. These were often grounded in a genuine interest in the communicative role of art and architecture, stressing the relationship between user/observer and the work of art. It is precisely the involvement of the observer in the observed, so core to second-order cybernetics, which I regard as an important element in my exploration of presence design and its relationship to architectural design. Architecture, by comparison, seems to have left the observer – or user– quite unattended.

30. The installation 'Open Burble' at the Singapore Biennale 2006 by Usman Haque. The Burble is designed and generated on site, and in real-time by passers-by. The form changes colour in response to the way that it is manipulated by people who hold onto a railing. Haque writes: "Their actions affect both the run-time response (changing colours) and how it responds to them (because it was they who determined the shape and configuration of the structure in the first place)." (Cf. Haque 2007: 26) ((Photo from: 'HAQUE' 2009)

Lucy Bullivant, editor of a special issue of *Architectural Design* dedicated to 'Interactive Architecture', noted that there is an emerging wing of architecture and design which incorporates media and actively involves the public "…beckoning us like the rabbit in *Alice and Wonderland* to enter and participate in another world" (2007: 6ff). She means that by introducing new audiovisual elements, such designs recontextualize and transform the dominant narrative of a building. Bullivant describes this as a "prosthetic capacity of interactive architecture in its more design-oriented tendency can be assigned a range of innovative social roles".[64]

The issue is not whether such practices are labelled art, design or architecture but that they involve public participation, and thereby extend the notion of cultural design contexts. Bullivant characterizes these practices as

> …threshold crossing, rooted in the research and interpretation of cultural context in a global age. As computer systems increasingly structure society, to reinforce an urban sense of place by physical means may often be deemed insufficient. The projects of these hybrid specialists rely on custom-designed systems (...) where a multidisciplinary means to link physical and digital interfaces, objects and environments is vital. (ibid.: 23)

Of further significance is the explicit interplay between theory and practice which such design practices frequently demonstrate. This may also be formulated as the relationship

[64] Among others, Bullivant names the work of Jason Bruges in the UK, Scott Snibbe's Sona Research and Antenna Design in the US, the Interaction Design Lab in Italy and Daan Roosegaarde's studio in the Netherlands. For a recent survey, see Fox & Kemp 2009.

between 'creative' and 'critical' modes of inquiry, which has a bearing on practice-led and design-driven research. It is reasonable to suggest, using Donald Schön's concept of a 'reflective practitioner', that in facing new collaborations, designers are compelled to reflect on their disciplinary identity, while continuously interpreting, adapting, sharing and actualizing their expertise in practice (1988). Supported by theoretical tools and methodological self-reflexivity, this is a process which involves finding expressive ways for insights through practice alone, an expertise which Michael Polanyi referred to as 'tacit knowing' (1983: 65).

Design-led research is thus distinguished by an experiential component, but in considering new practices which increasingly transcend the boundaries of conventional design disciplines, the transdisciplinary nature of design-led research must may also be stressed. I elaborate on this in the section Method: research by design, which follows this section.

In their characterization of two modes of knowledge production which prevail in university research, Gibbons et al. contrast the conventional disciplinary production of knowledge (Mode 1) with a new and quite different form (Mode 2), which they define as "[k]nowledge production carried out in the context of application and marked by its: transdisciplinarity; heterogeneity; organizational hierarchy and transience; social accountability and reflexivity; and quality control, which emphasizes context– and use-dependence" (1994: 2f). Mode 1 knowledge, in contrast, is discipline specific and homogenous, 'owned' by a specific research community, and subject to quality control via peer-review.

The definition of Mode 2 thus foregrounds transdisciplinarity, a form of learning and research practice which addresses complex, real-world problems and necessitates co-operation between different sectors of society and academia. More recently, Julie Thompson Kein takes a similar approach:

> A practice-oriented approach, transdisciplinarity is not confined to a closed circle of scientific experts, professional journals and academic departments where knowledge is produced. Through mutual learning, the knowledge of all participants is enhanced, including local knowledge, scientific knowledge and the knowledge of concerned industries, businesses, and non-governmental organizations. The sum of this knowledge will be greater than the knowledge of any single partner. In the process, the bias of each perspective will also be minimized. (Thompson Klein et al. 2001: 7)

The methodology of design-led research in architecture raises a complex set of questions and debates. These are discussed in the following section, where I expand on the methodology I used to conduct my only design-led research in presence design.

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[65] To distinguish what can be made explicit ('propositional knowledge'), from what by definition cannot, Michael Biggs has more recently proposed the term 'ineffable knowledge' in the context of design-led research in architecture (2004).

METHOD: RESEARCH BY DESIGN

> Imagine altering the rule of chess which says that pawns can't jump over other pieces: they're now allowed to do this, as knights always were. The result would be that some games of chess could now be played which were literally impossible before. The greater the alteration, and the more fundamental the stylistic dimension concerned, the greater the shock of impossibilist surprise. (Boden 2007: 219)

> A practice-oriented approach, transdisciplinarity is not confined to a closed circle of scientific experts, professional journals and academic departments where knowledge is produced. Through mutual learning, the knowledge of all participants is enhanced, including local knowledge, scientific knowledge and the knowledges of concerned industries, businesses, and non-governmental organizations (NGO's). The sum of this knowledge will be greater than the knowledge of any single partner. In the process, the bias of each perspective will also be minimized. (Thompson Klein et al. 2001: 7)

Extending practice

This thesis is premised on the assumption that insights acquired through design practice, supported by the critical tools of history, theory and methodological self-reflexivity, can impact existing epistemological structures and substantiate a reformulation of disciplinary identity (Grillner et al. 2005; Hughes 2009; Hughes & Jones 2010; Rendell et al. 2007).

Helga Nowotny asserts that knowledge is transgressive and does not respect institutional boundaries:

> Nobody has anywhere succeeded for very long in containing knowledge. Knowledge seeps through institutions and structures like water through the pores of a membrane. Knowledge seeps in both directions, from science to society as well as from society to science. (2001)

According to Nowotny, the borders between science and society, while still distinct, are in the process of dissolving. Though it is widely accepted that innovation in industry and society comes from creating new links between producers of knowledge and users, 'reliable knowledge' within the sciences is still based on a mode of research in which there is a very clear separation of science and society. The kind of contextualized knowledge Nowotny calls for is one where the 'notion of users is extended' and genuinely informs scientific knowledge production.[66]

In regards design-led and design-driven research, I have already mentioned the need for creative and critical modes of inquiry and would now like to elaborate how these are interwoven to provide a strategy – through the interplay of theory and practice – for acquiring experiential knowledge in a tradition of collaboration. Architects often confront collaborative contexts, which demand the integration of many different kinds of expertise from heterogeneous sources of knowledge. As Nowotny comments, problem-focused interdisciplinary research is not new; separate strands of science-based activities have been brought together before, to meet tangible and complex real-world problems, for example, in areas of intense international competition, or in the interests of sustainable development.

[66] Nowotny comments on the notion of reliable knowledge: "The idea of discrete areas of specialization [is] structured on a model of communication that really has only two elements: the first one is that all research must be communicable in a form that can be understood by one's colleagues; and the second one is that it can attract a consensus, even if a limited one. Embedded in this model is a notion of reliable knowledge which comprises a whole series of relatively separate decisions about the integrity of a certain set of scientific findings, the limits of the integrity being dependent on the limits of the consensus achieved." (2001)

Perhaps it is possible to characterize my own ambition in writing this thesis primarily as *exploratory* or *transformational*, following on the work of Boden (2007: 219f). Grounded in an existing discourse – architecture – my aim in treating mediated spaces as architecture, (incorporating mediated spaces into architecture) is, effectively, to point towards an *extension of practice*, which may also be described as a transgression of disciplinary boundaries (or, at the least, an exploration of the limits of invisible disciplinary boundaries). To alter 'the rules of chess' by convincing the reader that mediated spaces may very well be incorporated to the realm of architecture, *transformative* would be a suitable adjective for this thesis, given that my central claim is that new spatial structures can now be fabricated, which could not have been fabricated before.

On the other hand, I also offer an alternative reading of this thesis. This is in line with Nowotny's assertion that new disciplines "arise continuously from interdisciplinary work" (2001), and one in which I put presence design forward as a new practice, around which a theoretical discourse is bound to form. What distinguishes this approach from the notion of an extended architectural discipline is the proposal that a new transdisciplinary practice will emerge, informed by several existing disciplines, including architecture.

Transdisciplinarity

In 1994, a book titled *The New Production of Knowledge* was published, in which Helga Nowotny, Michael Gibbons and other contributors presented a novel approach to science and knowledge production characterized as Mode 2 knowledge, which foregrounds transdisciplinarity as a new form of learning and finding solutions for the complex challenges in society (Gibbons et al. 1994). Mode 2 is contrasted with traditional disciplinary production of knowledge, Mode 1, which is discipline-bound, homogenous and concerns problems that are typically raised and solved within a specific academic research community. Mode-1 knowledge is quality controlled through peer review within one such academic context, similar to the traditional notion of scientific knowledge:

> For many, Mode 1 is identical with what is meant by science. Its cognitive and social norms determine what shall count as significant problems, which shall be allowed to practice science and what constitutes good science. Forms of practice which adhere to these rules are by definition scientific while those that violate them are not. (ibid.: 2f)

Against the above, Gibbons et al. define Mode 2 as knowledge production marked by transdisciplinarity and heterogeneity, an approach which has been further developed by Thompson Klein et al. (2001), Nowotny (2001), Nowotny et al. (2001). Elaborating on the relationship between Mode 2 knowledge and transdisciplinarity, Nowotny writes:

> What we were trying to convey by the notion of transdisciplinarity is that, in Mode 2, a forum or platform is generated and it provides a distinctive focus for intellectual endeavour, and it may be quite different from the traditional disciplinary structure. In a Mode 1 system, the focus of intellectual endeavour, the source of the intellectually challenging problems, arises largely within disciplines. This may still go on, but other frameworks of intellectual activity are emerging which may not always be reducible to elements of the disciplinary structure. Rather, it is in the context of application that new lines of intellectual endeavour emerge and develop, so that one set of conversations and instrumentation in the context of application leads to another, and another, again and again. (2001)

In further reflecting on this emergent form of research, Nowotny explains that the transgressiveness of knowledge is better captured by the term transdisciplinary:

> [T]ransdisciplinarity has a semantic appeal which differs from what one often calls inter- or multi- , or pluri- disciplinarity. Note that the prefix - trans- is shared with another word, namely transgressiveness. Knowledge is transgressive and transdisciplinarity does not respect institutional boundaries. There is a kind of convergence or co- evolution between what is happening in the sphere of knowledge production and how societal institutions are developing. (ibid.)

Architects will find it easy to relate to the concept of transdisciplinarity, defined as a "form of learning and problem solving involving cooperation among different parts of society and academia in order to meet the complex challenges of society." (Thompson Klein et al. 2001: 7). Architects are accustomed to participatory processes which integrate the perspectives and knowledge of various disciplines and stakeholders so characteristic of transdisciplinary practices (Hirsch Hadorn et al. 2007: 437). An architect is, in effect, a designer of complex systems, a coordinator and leader of collaborative design processes informed by disciplinary expertise from various contributing parties. Architecture may be the best-positioned discipline to advance transdisciplinary practice, as it conforms to the many definitions of transdisciplinary practice and knowledge production specified in both Mode 1 and Mode 2. We should, therefore, observe how architecture, as a discipline, continues to incorporate new knowledge founded in interdisciplinary practice. What are the means to achieve an integration of new perspectives? Surely, there is already transgression? It is the focus on transgression and concern for how existing practices can be changed which prompts this elaboration on transdisciplinarity here. As proposed by Hirsch Hadorn et al.:

> Transdisciplinary research analyses complex empirical questions (systems knowledge), it aims at determining goals for better dealing with problems (target knowledge) and investigates how existing practices can be changed (transformation knowledge). Transdisciplinary research takes interrelations between knowledge form into account and includes heterogeneous sources of knowledge by iteratively integrating knowledge components and forms. (ibid.: 436)

Let us look more closely into how heterogeneous sources of knowledge may be incorporated into a reflective design practice.

On reflective practice and rule-following

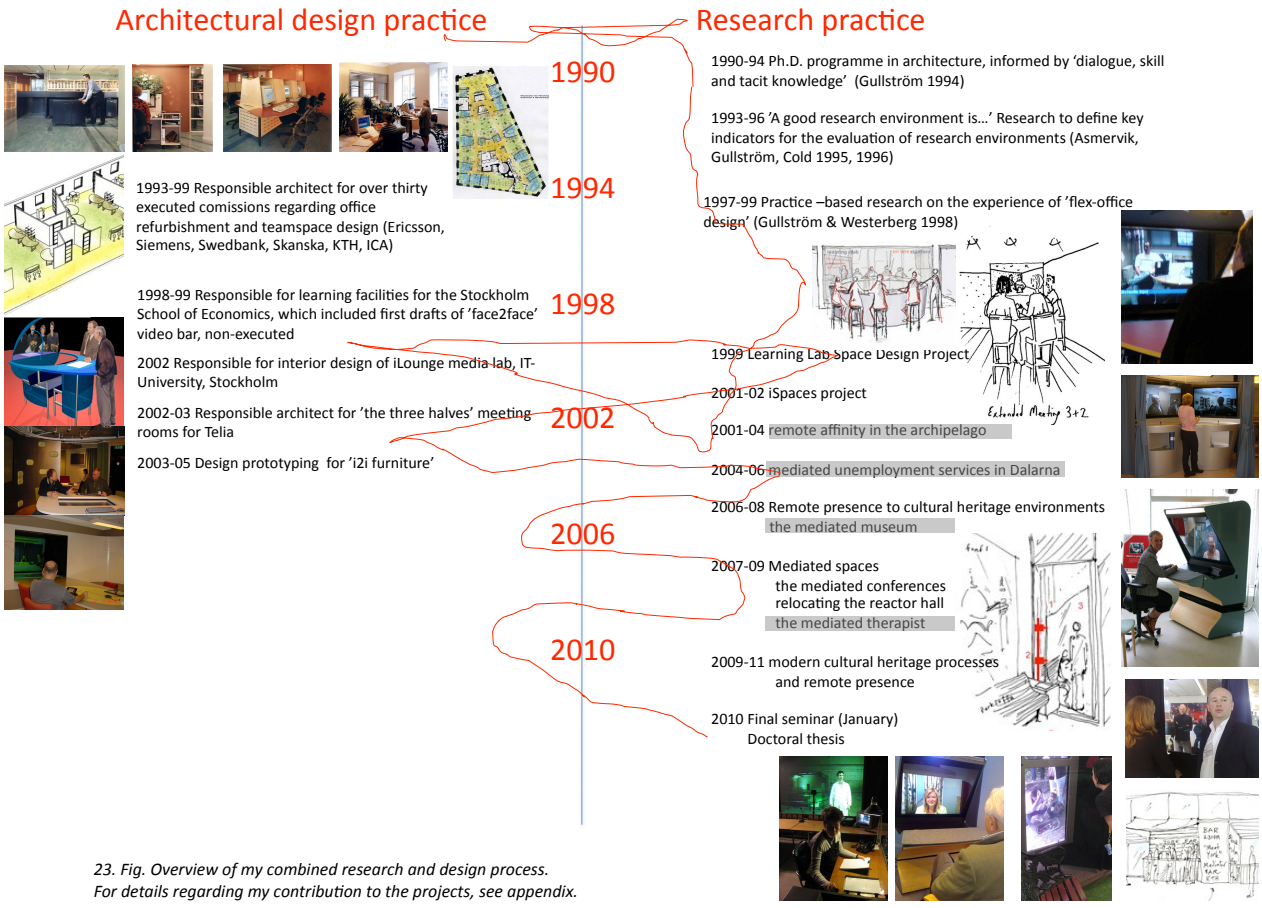
In my thesis, the notion of an extended practice is interwoven with the idea of a transdisciplinary practice, as is the interplay of theory and practice. I do not think of either in opposition to one another, but rather as contributing to a strategy or method of creative and critical thinking. I draw on examples, both those that emanate from my own practice, as well as those from related practices, to make comparisons. This provides a form of analogical thinking, triggered by a process of comparing and contrasting the similarities and differences between particular examples.

Aristotle taught us that reasoning by examples is fruitful and quite different than both inductive and deductive reasoning: "Clearly then to argue by example is neither like reasoning from part to whole (the inductive pattern), nor like reasoning from whole to part (the deductive pattern), but rather reasoning from part to part when both particulars are subordinate to the same term and one of them is known." (Aristotle 1971: 90). Immanuel Kant has similarly stressed the importance of examples in developing judgement referring to examples as "the go-cart of judgement" (1963: 178). He spoke of exercising judgement as an ability that can be practiced, but not taught: "Judgement in general is the faculty of thinking the particular as contained under the universal." (1952: 18). In architectural practice, it is often the case that we must draw on our individual judgement in situations when the established repertoire of concepts and theories fails us. In fact, this discussion regarding judgement brings to light the close relationship between practice and theory which I will address in this section centred on methodology.

At the outset of my professional career as an architect in 1990-94, I was establishing an architectural practice in parallel with beginning doctoral studies at the Royal Institute of Technology in Stockholm, where I was part of a research milieu dedicated to issues of professional skill and practical knowledge based on Wittgenstein's late philosophy.[67]

[67] My supervisor at the time, Professor Jan Henriksson, was Dean of the School of Architecture. Philosopher Tore Nordenstam at Bergen University was made adjunct professor at the Department of Architecture, as well as Bo Göranzon, whose interdisciplinary network 'The Dialogue Seminar' sparked a rich academic environment.

Providing an encounter between different perspectives on knowledge, the research field 'Dialogue, skill and tacit knowledge' has developed over twenty years, founded on 'The Dialogue Seminar', a collaboration between the Royal Dramatic Theatre in Sweden, the Swedish National Institute for Working Life, and the Royal Institute of Technology in Stockholm (Göranzon et al. 2006).[68] Simultaneously exposed to two different worlds (which, at the time, I felt that professional practice and academic practice represented), I was encouraged to make comparisons between my experiences as an architect and the academic context I was engaging in.[69] Over the years to come, the habit of moving between the contexts of practice and academic work has helped me to form a work strategy that has affected both practices and is now inherent to my identity as an architect. The overview, below, illustrates my combined research and design process, as it has developed over time.



23. Fig. Overview of my combined research and design process.
For details regarding my contribution to the projects, see appendix.

31. Overview of my combined research and design process. For details regarding my contribution to these projects, see Appendix 2.

The Dialogue Seminar, which included both practitioners and academics, developed into a research milieu to which several renowned philosophers have contributed for over twenty years, e.g. Tore Nordenstam; Kjell S. Johannessen; Georg Henrik von Wright; Stephen Toulmin and Allan Janik. (See e.g. Janik 1994; Johannessen 2004; Nordenstam 2007; Göranzon et al. 2006)

[68] Initially formulated as the 'Skill & Technology' programme, for which foundations were laid at a 1988 conference 'Culture, Language and Artificial Intelligence', a series of six volumes were edited by Bo Göranzon et al. (1988; 1990; 1991; 1992; 1995)

[69] My employment and doctoral studies included teaching at the Masters' programme in architecture 1990-1996. I was awarded the degree of 'Technical Licentiate in Architecture', an intermediate doctoral degree customary in Sweden, for a thesis entitled 'The Paradox of Mastery: On professional skill and knowledge transfer in Swedish architectural discourse of the 20th century', in which I explored the development of the architectural profession and the dissemination of professional skill in light of two conflicting ideals of knowledge: the German polytechnic tradition and the French Beaux Arts tradition (Gullström 1994, in Swedish).

Challenging the prevailing view that knowledge is exclusively of *propositional* nature, Donald Schön's 'reflective practitioner' (1988) as well as the research milieu which influenced me, is founded on a *pragmatic*, i.e. an action-oriented *process-perspective* of the conception of knowledge (Johannessen 2006: 229ff). This is well illustrated by the frequently quoted §78 of *Philosophical Investigations*, where Wittgenstein challenged his students to:

> Compare *knowing* and *saying*:
> how many feet high Mont Blanc is—
> how the word 'game' is used—
> how a clarinet sounds.[70]

Explaining why, in academia as elsewhere, experience based knowledge gained from 'reflective practice' so often is "simply left out of consideration", the Norwegian philosopher Kjell S. Johannessen explains that "the possession of this kind of knowledge expresses itself in a series of non-propositional ways in work life situations, as for instance through sureness in action, through reliable judgments, and through intuitive acting, in short through task-related *achievements*." (2006: 234). This is a pragmatic view that informed Ludwig Wittgenstein's late philosophy, as well as Michael Polanyi's concept of 'tacit knowing' (1958).[71]

In line with this, Johannessen defines *professional knowledge* by its two basic traits: "(a) it is acquired over a relatively long period of time and by individuals; and (b) attempts at articulating it in some reasonably satisfactory way all fall short of even elementary standards of plain speech." (Johannessen op. cit.: 229).

The focus of my exploration is to address, and possibly transgress, the threshold which delimits what professional discourse defines as architecture, and inside of which concepts and theories exist.[72] For Wittgenstein, this can also be referred to as an attempt to address the rule-following inherent to a language game.[73] In *Philosophical Investigations*, Wittgenstein refers to language games as "objects of comparison which are meant to throw light on the facts of our language by way not only of similarities, but also of dissimilarities" (Wittgenstein 1953: §130) Later he says: "We shall give examples and these will include what one may call inductively defined series of propositions." (ibid.: §135) A skilful and informed practitioner will acquire an understanding of their discipline's language game, in order to act, make useful decisions and interpret the rules inherent of the specific practice.[74] The subject here, once again, is the concept of judgment, and specifically professional judgment, which a 'reflective practitioner' may develop over time and will use to make decisions and actions in practice. Schön's formulation of this is 'reflection-in-action', a process which develops the ability to

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[70] Wittgenstein (1953). The English philosopher Gilbert Ryle contributed a similar distinction between 'knowing that' (propositional knowledge) and 'knowing how' (practical knowledge) in rejection to what he referred to as 'the intellectualist legend', which viewed intelligent practice as the mere application of appropriate theory: "To do something thinking what one is doing is, according to this legend, always to do two things; namely, to consider certain appropriate prepositions, or prescriptions, and to put into practice what these propositions or prescriptions enjoin. It is to do a bit of theory and then to do a bit of practice." (1949: 29)

[71] Citing Polanyi, the renowned philosopher of science Thomas Kuhn explained tacit knowing in the following terms: "knowledge that is acquired through practice and that cannot be articulated explicitly" (Kuhn 1962: 44, footnote).

[72] Kuhn (op. cit.) refers to a repertoire of concepts and examples which sustain a certain paradigm.

[73] As clarified by Nordenstam, Wittgenstein's concept of rule-following does not refer to mechanical rules or routine procedures but to "a creative addition to a given series". Thus there is no contradiction between creative action and rule-following: "To perform an action is to act in keeping with a number of rules, which usually remain implicit. When needed, the rules can be partially articulated, however only partially." (Nordenstam 1983: 57f, my translation). Wittgenstein himself stressed this distinction in his lectures on aesthetics (1938: 7ff) and where he laid out the foundations for aesthetic language games to a small group of students noting: "What belongs to a language game is a whole culture." (ibid.: 8); and "In order to get clear about aesthetic words you have to describe ways of living." (ibid.: 11)

[74] When a student objected to Wittgenstein's statement that all the greatest composers wrote in accordance with the rules. Wittgenstein's reply was illuminating: "You can say that every composer changed the rules, but the variation was very slight; not all the rules were changed." (Wittgenstein op. cit.: 6)

acquire knowledge from reflective practice and critical reflection of one's own and others' opinions, proposals and plans (1983).

Wittgenstein specifically used the concept of 'aesthetic judgment' in his remarks on practices, which have been referred to as 'aesthetic practices', and may equally well be referred to as 'design practices'.[75] His lectures frequently addressed what is required for a composer of music (an architect, or a tailor etc.) to recognize and make what can be considered the 'right gesture'(Wittgenstein 1938: 31). In effect, architects and designers provide good examples of practices where decisions are continuously made on the basis of what may be called 'action-oriented knowledge' (von Wright 1971) or 'knowledge-in-action' (Molander 1993), characterised by the practical reasoning which precedes an intentional and goal-oriented action, and marked by a process of evaluations for and against a certain course of action.

It is in light of the above that the critical reflection and articulation of design practice which this thesis attempts ought to be considered. The different sections of this thesis are intended to illustrate the different means of articulation available to a reflective practitioner. Some of the design experiences and particular instances I refer to emanate from my own reflective design practice. Other examples are taken from related visual practices and represent or sustain a current design paradigm, which I argue may be extended to include mediated spaces. (This could also be formulated as an attempt to instigate discursive and conceptual development within my discipline). Although each chapter of my thesis represents a different approach to reflective practice, it is perhaps most clearly illustrated by the third chapter, where I use the voice of the critic to address my own design-led research. I put forward examples and point at similarities and dissimilarities as a means to articulate the concepts rooted in my own practice as a designer of mediated spaces over ten years.

Other examples are also put forward, subject to my own critique, in the aim to discuss the potential of a new aesthetic practice: presence design. When I state my ambition to outline an interdisciplinary aesthetic practice, I follow Wittgenstein in pursuit of identifying 'objects of comparison' and concepts which may serve practitioners in a new language game.

As a contributing practitioner or researcher in interdisciplinary projects over many years, I have noticed how difficulties in interdisciplinary collaboration can often be related to the lack of vocabulary in a shared discourse. Exposed to a culture of engineering, problem-solving and prototyping, which in essence do not differ from architectural design, the other represented professionals and I have been forced to clarify our conceptual tools and define our professional skills in ways which benefit the articulation inherent to a reflective practice. It is not practice that separates us as much as professional discourse. Forcing an articulation of tacit knowing has been fruitful; I have experienced that such interdisciplinary teams can facilitate creative problem solving and design.

Design-led research and practice

My understanding of reflective design-led research methodologies is therefore influenced by my personal experience in interdisciplinary collaborations as a designer and researcher. In the above I have briefly described the close link between professional practice and its related theoretical articulation through academic practice, and views which have informed my own view on a design-led research methodology. In my own case, the need to articulate my design practice has continued over many years. Initially triggered by a parallel intermingling of research-based and design-led activities, my own research methods have been refined as much by the reflection and critical analysis which academic writing demands, as from the need for practical decisions, design actions and professional judgment which particular projects have required. In fact, I want to stress that it is the intertwining as such which has

[75] Cf. Nordenstam and Johannessen, who have elaborated on Wittgenstein's concept of 'aesthetic judgment' in relation to 'aesthetic practices' (see e.g. Danbolt et al. 1979; Nordenstam 1978). Nordenstam uses the term 'aesthetic competence' to describe the informed understanding required in an 'implicit beholder' to appreciate, for example, a work of art.

formed the basis for my reflection-in-action. I now find many similarities between the work of a designer and the work of a researcher. The tools I use as a designer have come to resemble the tools I use as a researcher. I would even describe them as *very* similar.

In recent years design-led research has attracted a lot of interest across Europe, notably in the Nordic countries, the UK, Belgium, and the Netherlands, as a platform for research in the design disciplines. Such disciplines, which incorporate expertise in art, craft and design, are well served by methodologies based on the explicit interplay between reflective practice, material practice and communication strategies. Supported by the critical tools of history, theory and methodological self-reflexivity, design practitioners employ their aesthetic judgment in seeking expressive forms of representation, rather than articulation. The tools are indeed quite similar, but where design strategies aim towards an action, research strategies aim towards an understanding and articulation of implicit discursive concepts. Lundequist illustrated this by noting the distinction between "what an architect does" and "what an architect knows" (1982). What architects and designers do can be described as an iterative process of simulation, model-making and prototyping, which is organized as a sequence of problem-solving stages. Such an iterative design process is characterized by deadlines and tollgates requiring knowledge-in-action, and where certain phases can be distinguished: (1) Virtual modelling and prototype construction; (2) Simulation and scenario construction; (3) Implementing a design; (4) Evaluation of the design (based on Lundequist ibid.: 70).

Finally, I want to mention an inherent feature of all research methodologies, namely what concerns writing as a means of articulating research. In writing this thesis, I have felt a strong identification with what Anne Friedberg formulated as a need to challenge the limitations of print and the writing of a linear text when she described her experience from writing *The Virtual Window* (2006). She commented that "the process of writing/thinking in the linear form of a book was a frustrating exercise: writing about/thinking about new media in the form of old media",[76] and as a result, she later designed an online interactive 'textual extension' of her book (Friedberg 2007).[77] The web project, she suggests, "forms a tangent to the matrix of concepts in the book, supplying vivid examples of the still and moving images that have -- in the span of centuries -- filled the apertures of our windows, frames, and screens." However dynamic and mutable than a printed book this may be, she stresses that it also "demonstrates the difficulties of how to make a linear argument, the kind that can be sustained and supported over the long haul and in the many pages of a book" (ibid.).

In the beginning I found it incredibly difficult to combine both the literary and the theoretical, the visual and the experiential in the form of one linear text. To address this challenge, I decided to juxtapose the tools of the design practitioner with those of the academic. While the first, second and third chapters quite explicitly belong to the academic, the third and fourth, as well as the design examples, illustrate a practitioner's use of analogical thinking, and use of drawings and visual references.

The benefit of this structure is also that it allows the theoretical foundations that I lay out in the first chapters to be applied to my design-led research experiences (as presented in Chapters 4 to 7), by moulding them together as three 'critical and creative' essays, which I present at the end of the thesis. In writing these essays I was able to make use of theoretical insights already presented, allowing me to circumvent the longer argumentation and explanations otherwise required, so as to stretch my own argument in ways that relate the application of knowledge I have acquired.

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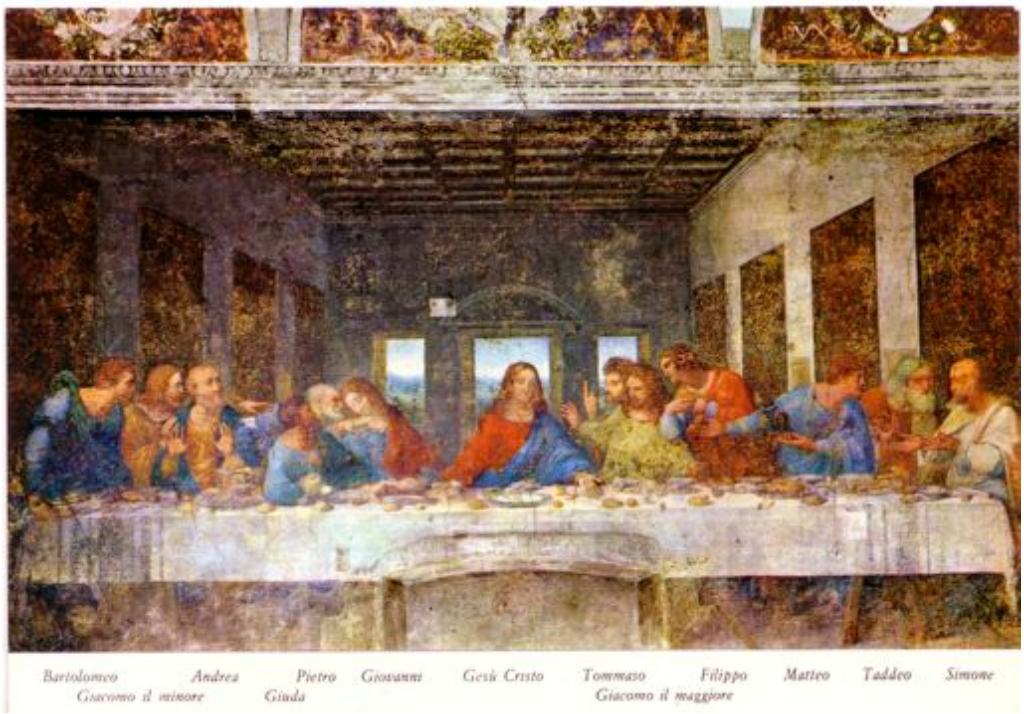
[76] Quote taken from Friedberg's response to a review of *The Virtual Widow* by Christy Dena (2008).

[77] With a similar intention, Caroline Nevejan develops an online version of her doctoral thesis (Nevejan 2007), see http: //www.being-here.net; http: //www.xs4all.nl/~nevejan/presence/index.php5.

design example:
da Vinci's Last Supper



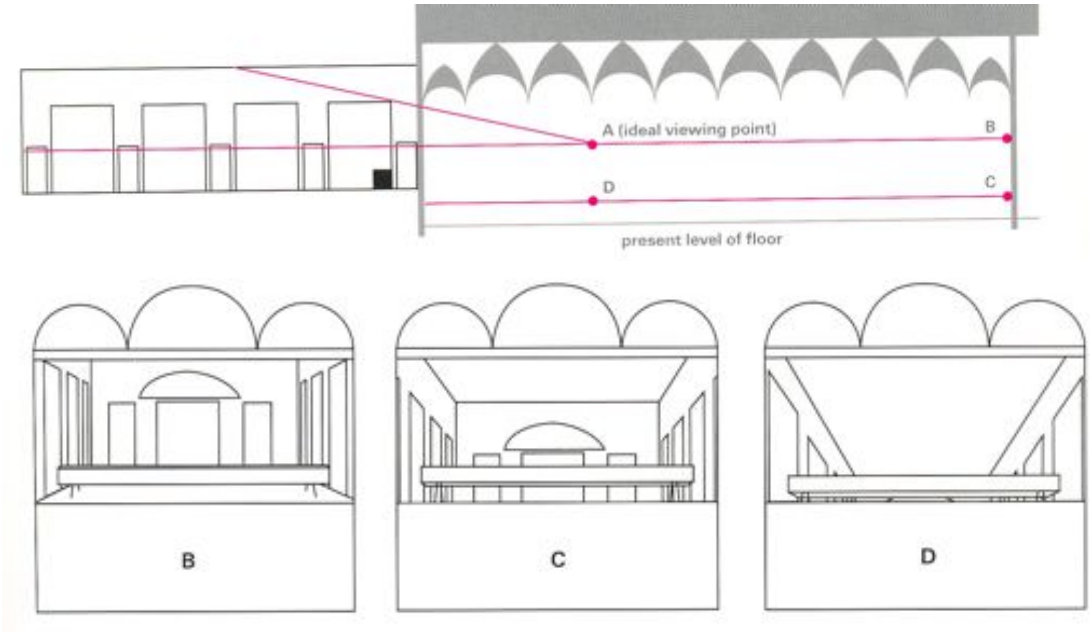
32. 'The Last Supper' by Leonardo da Vinci, depicting Jesus surrounded by his disciples. (Postcard, Ed. L Scrocchi, Milano)

Leonardo da Vinci was a presence designer, as put forward in Chapter 1. His design tools were slightly different than the tools designers employ today, but da Vinci's application of aesthetic design concepts is still instructive to those who design mediated spaces today.

In his analysis from 1979, Danbolt showed that the mural was part of the spatial design of the refectory. Unlike his fellow art historians, who seemed to think that the mural's form and content were mere coincidence "…as if da Vinci's hands were free when it came to executing the motif", Danbolt provided an account of the full aesthetic context in which *The Last Supper* was commissioned and conceived (Danbolt 1979: 70). In so doing, he was able to explain the techniques da Vinci used to assemble two different functions in response to the commission. Leonardo da Vinci was a skilled artist, and it was obviously not due to a lack in

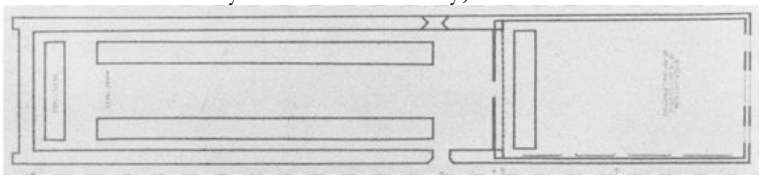
skill that he opted not to follow the standard rules perspective. We may safely assume it was intentional.

As previously described in Chapter 1, da Vinci's break from the rules of perspective had long perplexed historians. The complexities of the design are illustrated by Ladwein (2007) below.



33. Ladwein (2007: 56f) has drawn a longitudinal section of the refectory (based on Pedretti 1980) and, below, a three-dimensional reconstruction of the pictorial space, as seen from the viewing-points B, C, D. (Based on Naumann 1979)

By 1973, Steinberg and others had already dismissed the idea put forward by German scholars, of a painted *framing border* surrounding the picture.[78] They showed that the space in which Jesus and the disciples are seated shares the same ceiling as the refectory (obscured by the horizontal beam) and that it can be interpreted as a kind of raised stage or balcony, rather than a continuous spatial extension.[79] From this analysis, the table depicted becomes the fourth table in the layout of the refectory, as seen below.



34. The tables in most refectories were placed as shown in this plan and projection of the virtual pictorial space (to the right) as proposed by Steinberg (1973), where the monks were seated opposite each other at the long tables and where, consequently, the senior priests would face Jesus and his disciples.

But why were the figures and furnishings oversized? This makes it appear as if the table "springs from the wall and stands inside the refectory, as part of the monks' own dining table (…) as if Jesus and the disciples are sitting in a house where the fourth wall is removed, a house which on either side is surrounded by a short street with walls" (Danbolt 1979: 87). By introducing us to the monks' religious practice for which this picture was specifically conceived (the refectory of a cloister), Danbolt presents us with the necessary clues,

[78] See e.g. Steinberg (2001: 156) for a full account and why such views were common in the 19th century and still published in 1958.

[79] In 1973, Francis Nauman, a student of Steinberg's at the time, made an ingenious contribution to the debate by proposing a close analysis of the lower right corner "…not as part of the wall, and not as a flat framing member, but as the inward flank of a pier or corner pilaster, a fictive prop for the false architrave to rest on; a most welcome member, seeing that the architrave has no other means of support" (Steinberg 2001: 159).

conventions and modes of rule-following for better understanding the intended functions of this painting at a time when the cloisters were being reformed. From this account, we understand how the mural is part of a design scheme that services the specific needs of a monks' refectory in its everyday use.[80] Although there is no evidence of the actual brief, it is known that the painting was commissioned in 1494 by the Sforza family in charge of the cloister, and finished four years later. The refectory, in which, day after day, the monks sat down to eat under the watchful gaze of Jesus and his disciples, must be imagined in this original setting and as a *shared mediated space*. Danbolt contributes a historical-paradigmatic interpretation with reference to similar refectory designs where, as here, Judas' *culpa* is addressed: "We are in Jerusalem. In the background, over the roof-tops, we see a glimpse of Golgatha and the crucifixion, the consequence of Judas' action." (1979: 87) The formal analysis has made clear that da Vinci uses the table as a transmitting device between pictorial space and the refectory, in which the table is neither fully attached to the former (oversized), nor to the latter. This results in a contradictory, hybrid, spatial concept, and one where the historical-paradigmatic is deliberately interwoven with an actualising function. Because the table and the disciples are oversized in relation to the pictorial space, it appears as if the table is extended into the refectory, rather than a part of the pictorial space:

> From the monks' perspective, the table appears closer than the space surrounding it. It is as if the table meets the monks' table in such a way that a close circuit is achieved. '*Christos solute seen Abendmahl be idem Dominikanern zu Mailand einnehmen.*' Goethe was right in only mentioning Christ, not the disciples. For they do not eat: their facial expressions and gestures reveal that they speak in consternation. And Judas, the instigator of such reactions, is conveniently placed among the other disciples, in such a way that nothing refrains Jesus from meeting his monks. The *actualising* function is achieved. (ibid.: 88)

Seen from the corner of the eye, monks are reminded of Christ's presence – seated at the end of the table and sharing the meal – addressing each of them through the lector's voice. What da Vinci represents is the reminder that Judas' behaviour has destroyed the whole meal; he has shaken the disciples and excluded them from the fellowship: "Not only Judas himself (and Judas monks) will suffer, but the whole community. Only Christ remains the same." (ibid.: 89)

I have used this example to show, on a general level, that the monks were quite familiar with moving between different kinds of (virtual) space and, more specifically, that the refectory (including its artwork) is the result of an intent to combine virtual space(s) and real space(s) in intricate ways. In today's context we may refer to this as a 'virtual pictorial space', and as a form of communication made possible by means of art and architectural media. The monks are, symbolically, sharing the room – even dining – with Jesus who, however, is not physically present. The monks are inside a 'real space' when they encounter this 'virtual space'.[81] They are, thus, in a 'hybrid space', 'mixed-reality space', 'composite space' or, as I refer to it, the monks are in a 'shared mediated space'. Having introduced the notion of an architect – in this case Leonardo da Vinci – as a presence designer, I will in the following point at other examples from the history of presence design that may inform contemporary practices. The conceptual and technological tools have varied throughout history, but upon taking a closer look, there are many similarities between the virtual spaces we presently encounter, and those from centuries ago.

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[80] Ludwig Wittgenstein has stated: "An intention is embedded in its situation, in human customs and institutions. If the technique of the game of chess did not exist, I could not intend to play a game of chess." (Wittgenstein 1953; 1991: 337). Cf. Nordenstam (1978; 2007 section 2.1 'Explanations in the history of art') who, to understand of a work of art, distinguishes between intentions which are embedded in the work of art and other declarations, e.g. the artist's statements.

[81] Following Summers' (2003) distinction between 'real space' and 'virtual space'.

chapter 3 the origins of presence design

3

Struck with fear, by the presence of God, who seeth all…

> "E quant la primere eschele de Juda apparut,
> li enemi orent grant paor por la presence de Deu qui tot voit,"
> (Machebees II 12.22)

In search of the etymology of 'presence', the *Littré* dictionary cites the Old Testament, Machebees II, as the earliest appearance of this word in old French. It emerged from the Latin *præsentem* and *præesse* (*præ-* 'before' and *esse;* 'to be'), meaning 'to be before someone', or to be 'at hand'.[82]

In its English translation, the twelfth-century text from Machebees is as follows: "But when the first band of Judas came in sight, the enemies were struck with fear, by the presence of God, who seeth all things, and they were put to flight one from another, so that they were often thrown down by their own companions, and wounded with the strokes of their own swords." (Douay-Rheims 1582)

The Oxford English Dictionary (OED) establishes several other meanings of presence. In a religious context of use, such as that quoted above, *presence* can refer to "the manner in which Christ is held to be present in the Eucharist". In an acoustic or musical context, *presence* can mean "the quality in reproduced sound that gives a listener the impression that the recorded activity is occurring in his[/her] presence". Further, in politics the following definition prevails: "the maintenance by a nation of political interests and influence in another country or region". The OED suggests that the term is frequently used with a vague reference to a place or a space in front of a person, or in his/her immediate environment, such as '"*in his/her presence";* or "*in the presence of".* In poetry this usage may denote the actual person (or thing) that is present, and often with an implication of an impressive appearance or bearing as, for example, in Shelley's Epipsychidium: "A divine presence in a place divine (…) And from her presence life was radiated" (Shelley 1821: 135, 325).

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[82] *Le Dictionnaire de la langue française*, known as *Le Littré* after its main editor Émile Littré, was a dictionary of the French language first published by Hachette between 1863 and 1872 (Littré 1863-1872).

INTRODUCTION

This chapter focuses on the origins of presence design, and was introduced in the first chapter via the example of *da Vinci's 'Last Supper'*. The chapter is divided into two parts: Part A: 'A Pre-history of Presence' charts the central role of the concept of presence across a range of visual cultures, in theory as well as practice; while Part B: 'Presence Design Avant la Lettre' examines the mediated spaces of interactive architecture, second-order cybernetics and generative design experiments of prototypical presence designers such as Gordon Pask, Cedric Price and the researchers at Xerox PARC.

The purpose of this division is to illuminate that presence design is a recurring feature in the history of design practice, be it in the construction of virtual pictorial space in Renaissance art; the manipulation of the viewer's gaze in Manet; the optical phantom projections and phantasmagoria that were popular around the time of the French Revolution; or the notion of presence that Diderot evoked in writing his vivid accounts of Vernet's landscapes. Even the new form of spectatorship, introduced by early cinematic media and modelled on the vaudeville, can be referred to as a design element, reinforcing the experience of presence. The reproducibility of the digital object changes our experience of cinema, as cinema develops from a mass ritual to a form of interactive communication. A reformulation of other practices, such as museums, is equally ongoing. In the world of digital images, there is no such thing as a copy; we always encounter originals, which are representations of absent, invisible digital originals. Here I draw on the work of Boris Groys (2008), who speaks of contemporary museum curators as designers of mediated spaces, with the capacity to turn the invisible into the visible.

Having thereby outlined the 'pre-history' of the field, I turn to a cybernetic setting in London, centred on Gordon Pask and his colleagues, many of whom were architects. I point at Nicholas Negroponte's initiatives at MIT Media Lab; Douglas Engelbart's at the Stanford Research Institute; and discuss, in greater detail, the seminal mediated workplace at Xerox PARC. These, I argue, are the true precursors of what I designate as presence design.

A further aim of this chapter is to introduce a sequence of aesthetic concepts, selected from my personal design experiences and my design-led research related to presence design: *mediated gaze, spatial montage, active spectatorship, mutual gaze, shared mediated space, offscreen space, lateral and peripheral awareness, framing and transparency*. Each concept will, throughout subsequent chapters, be discussed in relation to my design examples but, as we will see here, they were previously used in related visual practices throughout the history of presence design.

In the course of this chapter, I will observe how different forms of spectatorship are related to participatory performance practices within the visual arts, noting that in architecture the term 'spectatorship' is less used, as architecture more often refers to 'user participation' in a design process. A revised approach to architecture, based on an active form of spectatorship, is presented in the Part B, which introduces generative design strategies and their origins in the second-order cybernetics milieus of the 1960s. As noted, many of those who contributed to this development were architects. I will return to the subject of an active spectatorship in Chapter 7, with specific reference to museum practices, and again in Chapter 8, arguing its relevance in an extended architectural practice – one that assimilates mediated spaces – by discussing architecture as a form of generative design. To substantiate this later discussion, I first establish the origins of presence design, observing selected historical developments in related visual practices.

PART A. A PRE-HISTORY OF PRESENCE

MEDIATED GAZE IN VIRTUAL PICTORIAL SPACE

As we encounter a 'virtual' space – on the surface of a frescoed wall, a cave mural, a digital projection or an Italian Renaissance perspective – we always find ourselves inside a 'real' space, the space we share with other people and things. In attempting to define 'virtual' space, David Summers describes it as the mastery of painting and the graphic arts: "Virtual spaces may be made to describe and record actual places and times, or they may simply seem to do so, projecting and elaborating imaginary ones. In all cases the space itself is credible, occupiable and traversable only in imagination." (2003: 43f) Although one may disagree with Summers and consider his definition oversimplified, the advantage of this definition is that it makes the spectator part of the activity on the scene: an active user of the mediated space. This is the notion of active spectatorship, which I will address as part of this chapter.

To many, the concept of virtual space appears recent and connected to new media. Contemporary viewers may find it hard to appreciate the strength of the 'old' visual media and the role that virtual space has played throughout history. Although the practices of art and media, as well as the roles of artist and spectator, have undergone major changes in the last century, there are many similarities that are nevertheless striking.

The characteristics of virtual space that the visual arts have fostered since the Renaissance, which triggered spectators to share architectural extensions, are well researched. The French philosopher Michel Foucault referred to "the game of dodging, of hiding, of illusion, or elision that administered occidental representational painting since the *quattrocento"* (2004: 23). In his lectures, Foucault sketched the fundamental components of this Western tradition which (1) masked the rectangular dimension of the canvas; (2) denied real daylight; and perhaps most importantly; (3) fixed the placement of the spectator at a certain site in front of the painting. Renaissance painting, says Foucault, attempted to obscure and veil everything implicit to the materiality of its medium. The spectator would look at a two-dimensional canvas as a window, 'looking out on the world,' by engaging with the painter's use of illusion and/or theatrical technique. The laws of perspective, as shown in the work of Renaissance artists and architects such as Brunelleschi and Alberti, allowed the projection of a three-dimensional space onto a two-dimensional surface. The projection opens up a depth and spatial coordinates in relation to the eye of the observer or spectator. One may experience visual immersion and inclusion as part of an environment that stretches, in one's imagination, far beyond the confines of the canvas, and beyond the real space one finds oneself inside. Stressing the notion of perspectival framing, Marie-Laure Ryan has described *visual immersion* in the following way: "From its spatial point of view the embodied gaze of the spectator experiences the depicted objects as virtually present, though the flat surface of the painting erects an invisible wall that prevents physical interaction." (2001: 3)

In terms of the themes addressed in this thesis, it is possible to compare Alberti's *reticolato* (discussed further below) with later representational techniques and optical instruments that emerged to support the 'perspectival gaze' (Crary 1992; Tomas 2004). This is also the underlying parallel made in Anne Friedberg's extensive study, *The Virtual Window: from Alberti to Microsoft* (2006). Friedberg describes how windows, frames and screens construct perspective, and writes about our movements through both architectural and virtual space, the materiality and immateriality of these spaces, as well as our mobility and immobility as users of the screen interface. Inasmuch as Alberti's window implied a positioned view for its viewer, Freiberg claims that virtual windows, such as Microsoft Windows™, do the same. The latter, in contrast to the former, fractures the positioned perspective. While the window, frame and screen fix the spectator in an immobile position, the material screen into virtual space strives to achieve movement, through its representation of multiple views and spaces that aren't really there. The visual field of a computer window is rarely direct, she explains, which is why its representational function becomes iconic. Her argument concerns the fracturing of a subjectivity that was once singular and perspectivally located, but which more recently is fractured and multiplied. Although she mentions "postcinematic visualities" of the late twentieth century and discusses how convergence is born as a "codependency of the

movie screen, TV screen, and computer screen"(6), she does not discuss windows in terms of architectural extensions that enable remote presence and mediated interaction.

In the following sections I will observe how different concepts of *virtual pictorial space* relate to perspective, and how the emergence of new optical instruments in the beginning of the nineteenth century triggered a transition in terms of spectatorship. These examples illustrate, in effect, *presence technologies,* although the early instruments by necessity included a time delay. As such, I suggest that we can compare them to current media for transmitting images through video streams in real time. I will show that some aesthetic concepts may be borrowed from these related visual practices, and can be fruitfully applied to presence design today.

35. Painting titled 'Las Meninas' by Velazquez, 1656. (Museo del Prado, Madrid)

Mirrors and gaze: 'Las Meninas' by Velazquez

The painting above is Diego Velazquez' *Las Meninas* (1656), depicting the Spanish royal family. Note the depiction of the back of a canvas. As observers, we face the painter, who

appears to be fixing his gaze on us. We, as observers, are thus brought into the picture by a curious interplay, which created by means of a mirror. Who is the painter looking at, and who are we, considering the reflection of the royal couple seen in the mirror facing us? Foucault famously opened his book *The Order of Things* with a widely quoted analysis of *Las Meninas,* throughout which he dismantles the illusory space of representation and the interplay between observer, artist and model:

> The painter is looking, his face turned slightly and his head leaning towards one shoulder. He is staring at a point to which, even though it is invisible, we, the spectators, can easily assign an object, since it is we, ourselves who are that point: our bodies, our faces, our eyes. The spectacle he is observing is thus doubly invisible: first, because it is not represented within the space of the painting, and, second, because it is situated precisely in that blind point, in that essential hiding-place into which our gaze disappears from ourselves at the moment of our actual looking. (1966; 1989: 5)

It is the organizing role of mirrors that creates the conditions for the possibility of vision and perspectival gaze in this example. In his lectures and essays a few years later, Foucault credits the French impressionist painter Edouard Manet for instigating the definitive rupture of a long-standing paradigm. But before we discuss this 'release of spectators', a brief description of the perspective rules that have kept spectators in place over centuries might be in order.

The concept of a painting as 'a window onto the world' is commonly attributed to Leon Battista Alberti. Art historians have claimed that Alberti's mission was to instruct artists in the production of a picture representing the visible world, as if the observer of the picture was looking through a window.[83] What can be added here, I believe, is that Alberti's contribution emerged in a time when painting was a design tool within architecture, and when paintings were used to design and decorate spaces. As suggested by Collingwood: "Renaissance painters, acting as interior decorators, revived and elaborated the system of perspective already used by interior decorators at Pompeii and elsewhere in the ancient world." (Collingwood 1938: 153). In such practices, paintings provided a means to extend interior spaces.

Let us look a little closer at the technique documented by Alberti, as introduced by Brunelleschi, in order to later return to the question of whether paintings can be interpreted as spatial extensions of an interior architecture, fixing a viewer to a framed view.

Perspective rules

The origins of perspective drawing can be found in ancient Greek science related to Euclidian geometry:

This was translated as *perspectiva* into Latin (from 'perspicere', or 'to see through') as "the study of how light rays travel in straight lines but always fanning out pyramidally from the light source, and how the eye receives these rays and thus sees" (Edgerton 2006: 158).[84] After the rise of Islam in the seventh century, this science, then forgotten in the West, was re-discovered and developed by the Arabs. In his book *The Optics of Ibn Al-Haytham*, the Arab scholar Alhazen (AD 965-1040) described how rays of light entered the eye from sources of light and from objects that reflect and refract light. Alhazen's theory of refraction explained the privileged status of rays close to the axis of sight: they travel unrefracted through to the optic nerve. But it was only after the slow re-conquest of Moorish Spain and Sicily during the

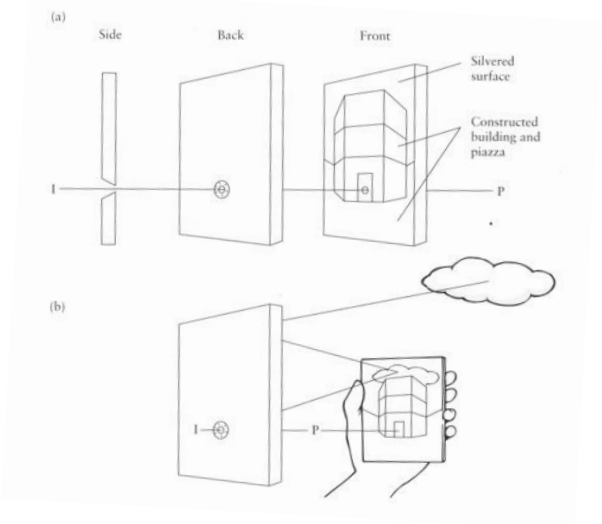
[83] Friedberg has challenged this idea of a transparent, 'window on the world', as is widely done by art historians and media theorists. She claims that Alberti used the window predominantly as a metaphor for the frame, to point at "the relation of a fixed viewer to a framed view"(2006: 12).

[84] In the following discussion of perspective, I draw extensively on the work of Samuel Edgerton, particularly his book *The Renaissance Discovery of Linear Perspective'* (1976) and article 'Brunelleschi's mirror, Alberti's window, and Galileo's perspective tube' (2006). See also Westfall 1969; Summers 2003; King 2001; Smith 2001; Baskins 1993; Howard & Rogers 1995.

eleventh century that this knowledge reached Western Christians again. This ancient science, which today we call 'optics', had nothing to do with the perspective of painting just yet.

The Renaissance motivation for adopting perspectival representation has been explained in terms of its allegorical relationship to theological and moral concerns. Christian opticians believed that a special relationship existed between the centric visual ray and the moral power of God: Therefore perspective rules were accepted by these early artists because it gave their depicted scenes a sense of harmony with natural law, thereby underscoring man's moral responsibility within God's geometrically ordered universe." (Edgerton 1976: 56). In the late Middle Age, mirrors were, for example, subject to scientific study, but also believed to have some sort of divine significance.

Around 1425, the Florentine sculptor, engineer, architect, and artist Filippo di Ser Brunelleschi carried out a famous demonstration on the square in front of the Florence cathedral, in which he painted a small picture of the Florentine Baptistery, applying the geometric rules of optical mirror reflection. Brunelleschi's picture was viewed by looking at its mirrored reflection, at arm's length and through a small hole he had drilled in the middle of the canvas. It is generally believed that this was the first painting in art history constructed according to the geometric laws of what we now refer to as artistic 'linear perspective' (which at the time was called 'perspectiva artificialis', as distinguished from 'perspectiva naturalis', the original science of optics). The significance of Brunelleschi's experiment is that it was a demonstration of applied optics, a translation from science to the realm of arts.



36. Summers' illustration of how Brunelleschi might have demonstrated his use of perspective. He writes: "The clouds over the actual Baptistery, reflected on the silvered surface of the top front of the panel, and the constructed building and piazza are united in the reflection on a small plane mirror held at arm's length." (Summers 2003: 515)

The panels that Brunelleschi used have been lost and we may not have known of his achievement, had it not been for Alberti, who documented Brunelleschi's experiment in his treatise on painting, intended as a practical handbook for artists. According to Edgerton, this is "the first document ever – anywhere in the world – to relate the optical laws of vision to the aims and aspirations of artists" (1976: 6). In his treatise, Alberti drew a gridded window instead of the mirror that Brunelleschi had used, thus redirecting the purpose of perspective art away from the divine order to a more secular physical reality. Alberti's treatise on painting, *De Pictura*, first appeared in Latin in 1435 and his own translation into Italian, *Della Pittura,* came a year later (Alberti ca. 1435-36; 1970; 1972). It is here, in Book 1 of his treatise, that Alberti famously makes the comparison between the frame of a painting and a window:

> Here alone, leaving aside other things, I will tell what I do when I paint. First of all about where I draw. I inscribe a quadrangle of right angles, as large as I wish, which is considered to be an open window through which I see what I want to paint. Here I determine as it pleases me the size of the men in my picture. I divide the length of this man in three

> parts. These parts to me are proportional to that measurement called a *braccio*, for, in measuring the average man it is seen that he is about three *braccia*. With these *braccia* I divide the base line of the rectangle into as many parts as it will receive. To me this base line of the quadrangle is proportional to the nearest transverse and equidistant quantity seen on the pavement. Then, within this quadrangle, where it seems best to me, I make a point which occupies that place where the central ray strikes. For this it is called the centric point. This point is properly placed when it is no higher from the base line of the quadrangle than the height of the man that I have to paint there. Thus both the beholder and the painted things he sees will appear to be on the same plane. (1972: 55)

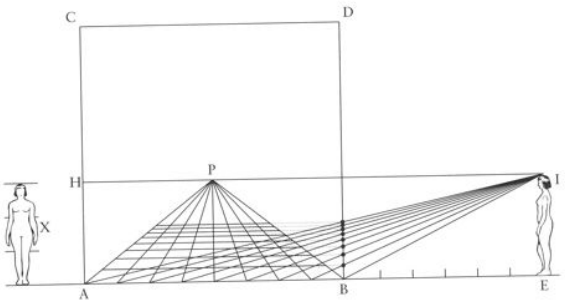
Alberti's treatise is divided into three parts, and whereas the first provides a discussion on perspective, the other two focus on the practice and purpose of painting. In the third book, Alberti addresses the narrative aspect of a painting using the term *istoria* ('story'), borrowed from rhetoric. Alberti stated that poets and orators could provide painters with subjects for *istoria*. The relationship between painters and poets is a recurrent theme in Alberti's writings (Westfall 1969: 491).

Alberti introduced the second book of his treatise with the notion of presence, stating that "Painting contains a divine force which not only makes absent men present, as friendship is said to do, but moreover makes the dead seem almost alive." (Alberti 1970) He proceeds to discuss painting as the foundation for all arts, including architecture, stressing that "any master painter who sees his works adored will feel himself considered another [G]od" (ibid.).

Alberti's reticolato

Alberti's ideas on perspective were illustrated by his so-called *reticolato*, a 'grid' (or 'grill' from the Italian 'graticola'), aimed to service as a mechanical aid to painters in the execution of the open window technique. It involved creating an actual grid across a window from which the artist would transfer the scene visible through the window to a correspondingly gridded canvas. It is questionable whether the *reticolato* was actually useful to painters. Barry Smith writes:

> Because parallax is here so strong, it is unlikely that such devices were ever in fact used by painters. Even the slightest movement on the painter's part will have a dramatic effect upon the scene perceived. We might think of the reticolato, rather, as a pedagogical device, designed to help the artist understand how perspective works. (2001)



37. Alberti's 'reticolato', as illustrated by Summers (2003: 521). The rays which extend from the artist's single eye pass out through the cells of the artist's grid and form 'a visual pyramid' along their way to their final destination: an array of planes that background the figure. The artist would transfer the contents of each cell onto the gridded notepad. Smith writes that these contents "have been 'measured' by the rays, which reach out like feelers to touch the corresponding portions of reality. In this way the artist can apprehend in systematic and accurate fashion the visual qualities in the scene before him." (Smith 2001)

Smith (2001) has compared Alberti's *reticolato* technique with later and similar projection devices with which an artist might, more or less scientifically, depict people and objects. He writes that such grids encouraged a new way of seeing; they were devices through which a portion of the visible world was organized into a geometric composition. Smith argues that

Della Pittura informed cartography, further claiming that the ontology of pictures can be seen in relationship to projective devices in general. This applies also to the projection onto reality that is involved in our contemporary use of maps, pictures, databases, catalogues and taxonomies of various sorts:

> A good map casts a transparent net over the surface of the earth in just the way Alberti's *reticolato* casts a transparent net over some portion of objective reality. As the painter's grid casts into relief a certain visual scene, so the grid of the map casts into relief a certain spatial region. (...) [W]hen using maps or spreadsheets we employ labelled grids to project in multi-rayed fashion onto corresponding objects in reality. (ibid.)

Alberti's contribution to the history of cartography has been noted by others (e.g. Edgerton 1976) and it is partly explained by the rediscovery of Ptolemy's *Geographia* (ca. 140 A.D.), which appeared in Florence in 1400 and was received with great enthusiasm. In the following section, I will discuss how Alberti's geometric perspective was gradually replaced in the nineteenth century. With the Impressionist painters, another approach was cast onto the world.

RELEASING THE SPECTATORS: MANET

In a series of lectures given between 1967 and 1971, Foucault analysed the work of Edouard Manet to explain the mechanics through which Manet released the spectator from the fixed and normative position in front of the canvas, thus providing a freedom from which the illusory qualities of representation could finally be questioned (Foucault 2004; cf. Nale 2005; Shapiro 2003; Boyer 2008).

38. Manet's 'A Bar at the Folies-Bergère' from 1882. (Courtauld Institute of Art, London)

Seen above is Edouard Manet's 1882 painting, *A Bar at the Folies-Bergère*. Foucault states that impressionism challenged the illusion of a penetrable space, specifically by disorienting the eye of the spectator, who by now was accustomed to the visual immersion and pictorial spaces of Alberti's 'windows onto the world'. The new materiality imposed by Manet's visible brush strokes directs the spectator's attention to the surface of the canvas; he also used lighting to blur the contours of objects. Suddenly a spectator is tempted to go around the canvas to situate herself, to change position in order to see what the painter sees.

Foucault's discussion centres around three themes: the articulation of space (and flatness of the image); the treatment of lighting (and elimination of any represented illumination in the painting); and the position of the viewer. He points at several incoherencies built into the structure of the painting. Firstly, it must be assumed that the painter stands in front of the barmaid, as well as on our left, since we both can see her and her reflection. Secondly, the man who appears in the mirror (and seems to be speaking to the barmaid) should also be visible in front of the bar, which he is not. Thirdly, the barmaid and the man are both looking downwards. As pointed out by Gary Shapiro, we might have expected his and her gaze to meet, or each of their gazes to meet our own (2003: 312f).

Although there is a mirror, the painting distorts what the viewer may have assumed to be a normal reflection. As Christine Boyer has noted, Manet here represents "incompatible spaces, incompatible reflections, and incompatible lighting reflections. The woman behind

the bar and the spectator simultaneously occupy different spaces and make it impossible to discern where exactly to place the painter." (Boyer 2008: 62) Foucault notes that since most of the picture is occupied by a large mirror behind the bar, the painting constitutes a 'double negation of depth', both because it is a painting and because the mirror flattens the scene it reflects.

A new model of vision emerges

Foucault's specifically chose *A Bar at the Folies-Bergère* to exemplify the active role of the spectator and the story that a subject tells of itself. For Foucault, Manet's mirror appears to invert Velazquez's mirror, which gathers all parties at one site. Several scholars have stressed the relation between these two mirrors, yielding an increased understanding of the development in vision that occurred in their time. A series of arguments are raised: both mirrors reflect inaccurately; both cause a peculiar flickering of presence and absence between the model, spectator, and painter outside the canvas; and both structure the placement and displacement of all parties, but in fundamentally different ways (Nale 2005: 148; cf. Boyer 2008: 63).

Foucault abandoned his plans to publish a book on Manet, but frequently used examples of pictorial space in his lectures and published several essays on artists. Foucault's interest in the mastery of virtual space can be compared to his analyses of social space (1977). Shapiro has observed: "In the Panopticon, the gaze is mobilized and fixed on each individual; a kind of floating or functional gaze from no one in particular – but in Manet, looks meet no object, no person, even though we see their source. What remains is an eye disconnected from vision." (Shapiro 2003: 310; cf. Jay 1994)

Like several other critics, Foucault observed that Manet often structured his paintings with clearly defined vertical and horizontal axes, which emphasize the materiality of the flat and rectilinear canvas and create a very shallow pictorial space. In another painting by Manet, *Le Bal Masqué à l'Opéra*, this shallowness is further emphasized by the lower edge of a balcony and a number of legs, chopped off beneath the knees. This discussion also anticipates the concept of *offscreen space,* which I use in relation to my design examples and address again in Chapter 7.

By means of capturing multiple perspectives, the cubists soon forced the spectator to occupy several points of view at the same time. Cubism thus shattered the physical integrity of space and body and created a game of imagination, which, as noted by Ryan, "…is no longer the projection of a virtual body in a virtual space but the purely mental activity of grouping shapes and colours into meaningful configurations. As art became more and more conceptual, the eye of the mind triumphed once again over the eye of the body." (Ryan 2001: 3)

Arguing that the appeal of a pictorial space that opens to the body is hard to stifle, Ryan suggests that towards the end of the twentieth century the sharply delineated dreamscapes of surrealism produced a comeback of immersive ideals. She describes an art scene divided between a conceptual school that engaged the mind with hyper-realistic images insisting on the presence of objects, and the three-dimensional installation art, where the actual body is placed in an intellectually challenging environment. Ryan, who observes the conceptual development of 'immersion' and 'interactivity' across technological and literary domains, explains that it is from this immersion that virtual reality games spring: "By letting the user walk around the display, and occasionally take physical action to activate data, installation art offers a prefiguration of the combination of immersion and interactivity that forms the ideal of VR technology." (2001: 4)

In his 1992 book, *Techniques of the Observer*, Jonathan Crary argued that the new model of vision emerged much earlier than Manet. Exploring the context of innovation and design which followed a sudden interest in the science of human vision and optics from 1820 to 1830, Crary points at a paradigm shift where the stereoscope replaced the camera obscura, which he deems responsible for keeping the 'perspectival' observer in place over the

centuries, and thus creating a new kind of spectator (which Crary called an *observer*)[85]. The stereoscope as such didn't produce an image; the observer did. Based on advances in optical sciences and the understanding of human vision, the stereoscope provided the observer with a new tool for vision that "…aimed to simulate the actual presence of a physical object or scene, not to discover another way to exhibit a print or a drawing" (Crary 1992: 122). Although they emerged simultaneously, it is the way an image is created that distinguishes the phenakistiscope, stereoscope and camera lucida from the panorama and diorama. In the latter two, the observer remains immobile and is subject to a predesigned optical and spatial experience. In contrast, the phenakistiscope and stereoscope act like the camera lucida. This has recently been noted by David Tomas, who writes: "The camera lucida creates a *virtual image in the eye* and not one directly onto a receiving surface of some kind" (2004: 106). These imaging devices of the early 1800s thus show similarities to the head-mounted displays used in virtual gaming today.

Spectatorship and pictorial space

It can be argued that an observer is always involved in the construction of a painting. In his influential work *Art and Illusion*, Ernst Gombrich addresses 'the beholder's share' and speaks of how prior experience is used as the viewer interacts with the painter's lines to establish its three dimensional illusion: "an incomplete painting can arouse the beholder's imagination and project what is not there" (1960: 204ff). Similarly, Wolfgang Iser refers to how the 'unwritten' part of a text stimulates the reader's creative participation (1988: 213), in an analogy applied to changes in the notion of spectatorship in literature and the interaction between a text and its reader.

Perspective techniques locate a viewer at a particular place from which one ought to look *through* the surface of the painting, as if it were a transparent window into a three-dimensional space. In identifying this position, we address the concept of spectatorship. However, as observed within philosophy and post-Lacanian theory, the identification process and the recognition of oneself as *being placed* somewhere are intrinsic to our experience of the painting. In his article 'Consciousness, Spatiality and Pictorial Space', David Greene notes that "In being implicitly or explicitly aware of having a point of view, the viewer is in fact also transcending that point of view and dissociating consciousness from both it and the three-dimensional object that the painter has depicted." (1983: 375) Basing his argument on Matisse's *Large Interior in Red* (1948) Greene argues that this painting both does and does not locate the viewer in a particular place, and accordingly, the 'my-own-ness of seeing' (a concept related to Sartre's philosophy) is both lost and preserved, so that the viewer is both non-spatial and spatial. After Matisse, Greene takes the same approach to a perspectival painting, Perugino's *The Delivery of the Keys* (ca. 1482). Here, the argument is that the use of perspective, which is much more consistent than Matisse's, detaches the viewer from the depicted scene and suppresses the 'my-own-ness of seeing', but in addition there are other aspects of the painting that sustain my-own-ness, so that in the end this painting also embodies both spatiality and non-spatiality.

A similar discussion stresses the fact that a spectator both is and is not part of a painting, such as that provided by the philosopher David Carrier, who investigates Jacques Lacan's concept of 'mirror stage'. If we look at a mirror, Carrier writes,

> The image reflects what is before the mirror. But that image exists in an imaginary space, that place behind the mirror surface accessible to sight alone; I can see it, and so can you, but nobody can touch it. If observing reflections plays a role in achieving self-awareness, then it may be important that I become aware early on of myself there, at some distance from my eyes. If I am in the imaginary space, the infinite regress cannot arise. What I see from my vantage point is myself in an imaginary space; I am not, paradoxically, where my eyes are situated. (1986: 5)

[85] As shown by Steadman, the practical use of the camera obscura was spread and regarded a useful tool among astronomers, architects and painters around the middle of the seventeenth century (2001: 14).

The notion of an 'active spectatorship'

While perspective was the primary tool used to engage a spectator by dissolving the boundary between illusion and reality, other means to evoke an active spectatorship exist. By depicting a delimited moment of a religious narrative, artists could, for example, encourage a spectator to complete the scene from his or her memory. More sophisticated audiences – 'sharp, clear-headed listeners' – when facing the same painting, were encouraged to make allusions to literature or other artistic practices (Shearman 1992: 246). In his book, *Only Connect: Art and the Spectator in the Italian Renaissance*, John Shearman explores the dynamic and transitive relationship between art and spectators in fifteenth- and sixteenth-century Italy. Shearman's notion of an 'active spectator' is a viewer who engages in an activity, or a sequence of moments, depicted in one single image. The immediate environment of the painting is also of importance. Shearman shows how artists were sensitive not only to where a potential spectator would stand, but also to the location of a painting, the placement of other works of art and the interior design. Shearman's book is a contribution to the broad and highly theoretical field of 'reception theory', in the sense that he describes how Renaissance art requires a spectator to complete its meaning and narrative plot, just as a transitive verb requires an object. Shearman's study is innovative in the way it demonstrates how such theories apply to the artistic practice. He observes that a work of art may be directed to a particular spectator, or a class of spectator. It has been objected that Shearman is more concerned with the intention of an artist than with the reception of the work. With such a focus, responses may seem more predictable than they actually were at the time (Barnes 1992: 802). As summarised by Heath et al., Shearman

> …points to the relevance of the ecology or setting in which a painting or sculpture is positioned, and to the ways in which the spectator actively 'connects' features of the object to action within the local milieu; a connection which is critical for constituting the sense and significance of conduct and its environment. Perhaps most importantly, it raises important questions concerning the circumstances or occasions on which objects and artefacts are viewed and of the competencies that people bring to bear in their recognition and interpretation. (2002: 11)

Shearman's notion of the 'active spectator' is useful to my understanding of visual communication and summarizes the discussion on spectatorship thus far. An artefact – material or immaterial – becomes intelligible through its interrelations with a spectator and the setting in which it is located. A work of art or architecture requires the engagement and complicity of the spectator. A spectator is actively involved in interweaving the depicted figures, the details and the narrative of a painting with its location within a designed interior (or exterior). Features of the artefact are transposed to the immediate environment, just as features of the environment become part of an artwork and provide a spectator with an inclusive and unique experience.

Heath et al. stress that, despite a large body of research concerned with language and gesture, aspects of conduct and experience remain surprisingly underdeveloped in research by the social and cognitive sciences focusing on visual communication (2002). They note that studies of social interaction are often dislocated from the practical situations of experience, and employ Shearman's thesis to examine how people in dialogic interaction explore and experience a mixed-media installation in a museum context. They are concerned with the mechanisms of dialogic interaction which constitute the sense and significance of objects and artefacts, and the ways in which material features reflexively inform the production and intelligibility of conduct and interaction.

In terms of real as well as mediated spaces, both gaze and path are directed by design. A similar relationship as that between the artist and an observer/spectator emerges between the designer and a user/spectator. Our focus now is to explore the 'spatio-temporal' aspects that distinguish the design of real spaces from the design of mediated spaces.

Panopticon space – Panopticon gaze

In comparing early optical instruments to the emerging technologies of vision – in terms of how these guide, oppress or tempt a spectator or user in one direction or another – we must consider a crucial difference in the function of contemporary presence technologies: they enable communication and interaction in real time.

Although an office interior today is often decorated with framed paintings that provide visual immersion of the kind previously discussed, there are new kinds of 'windows onto the world' which currently frame our workplaces. One may take it for granted that the office creates an enclosure the moment the door is closed. However, the moment, for example, one goes online, to 'skype' a colleague, the single workspace is transformed into 'an open plan office'. Employing different media, we all open virtual windows and doors to other locations throughout the workday. Current exposure to many different media has made us accustomed to moving between virtual spaces, and we use mediated spaces as part of our everyday activities, often without reflecting on it. Communication freeware such as *Skype* enables continuous communication across space and time, and can thus transform an office into a mediated space. However, mutual gaze is impossible because of the location of cameras involved. No matter how and where we gaze, it cannot be achieved.

39. Skype freeware can transform an office into a continuous mediated space but does not enable mutual gaze. This is due to the distance between the camera eye and the human eye: in mediated spaces we want to look at the person with whom we are interacting, not a few centimetres above, where the camera is located. On the left photo, my colleague Leif Handberg looks at me, as my image is displayed on his laptop. On the right, he is looking straight into the camera above his laptop, which is better for me but not natural for him: in dialogic interaction you want mutual gaze: to look at the person you are addressing.

The above example is comparable to the painter's gaze towards us in *Las Meninas* – I am seen, but experience a sense of insecurity, since my colleague is not catching my gaze. As I will show in Chapter 4 and 5, this often hampers the experience of presence in mediated dialogic interaction. In Chapter 4 I refer to this as an example of 'friction' that may inhibit the possibility for knowledge sharing in mediated spaces. No matter how and where we gaze, direct eye contact cannot be achieved. Many scholars have identified the eyes as the single most important feature of face-to-face interpersonal communication. In terms of mediated spaces, mutual gaze is observed as a determinant for users to experience a sense of presence (e.g. Acker & Levitt 1987; Ishii & Kobayashi 1992; Buxton & Moran 1990; Bondareva & Bouwhuis 2004; Verteegal & Ding 2002). What therefore distinguishes designers of mediated spaces is that gaze must be supported, in one way or another, in order to represent the same (or other) spatial relationships as would exist in a real space. As Foucault has shown, architectural design for real and social spaces provides a framework for gazing. Foucault's reading of Bentham's Panopticon space is really the analysis of an 'evil eye' represented through architecture (Foucault 1977; cf. Shapiro 2003: 294).

PRESENCE AND SPECTATORSHIP IN EARLY VISUAL MEDIA

The origins of presence design can be found in the visual arts, but also in theatre. In the following section I will explore Greek designs for presence in order to point at the similarities they have to contemporary mediated spaces. It is known that by the time Aeschylus' tragedy *Oresteia* was first produced (458 BCE), some type of stage construction existed, since these plays require central doors and an upper platform. Note the roof on which the watchman appears in the opening lines of Aeschylos' *Oresteian Trilogy* below:

> "It is night, a little before sunrise. On the roof of Atreus' palace a WATCHMAN stands, or rises from a small mattress placed on the hewn stone. In front of the palace are statues of Zeus, Apollo, and Hermes; each with an altar before it.
>
> WATCHMAN: O gods! grant me release from this long weary watch.
> Release, O gods! Twelve full months now, night after night
> Dog-like I lie here, keeping guard from this high roof
> On Atreus' palace. The nightly conference of stars,
> Resplendent rulers, bringing heat and cold in turn,
> Studding the sky with beauty – I know them all, and watch them
> Setting and rising; but the one light I long to see
> Is anew star, the promised sign, the beacon-flare
> To speak of Troy and utter one word, 'Victory!' –
> Great news for Clytemnestra, in whose woman's heart
> A man's will nurses hope. (...)"
> (Aeschylos' *Oresteian Trilogy*, I.41)

Rush Rehm has described the *skene* as a structure that was strong enough to support actors on its roof; an area that came to be known as the *theologeion* ('place where the gods speak'), since stage divinities often appeared there (1992: 34). He comments that the actors accessed the roof from a ladder placed inside the *skene* structure, behind it, or they arrived from above by the *mêchanê* ('machine'), from which the Latin phrase *deus ex machina*, ('God from the machine') stems.

It is believed that the original stage buildings were relatively low, rectangular structures with large central doors, possibly two other doors flanking the central one, a flat roof on which actors could appear, and possibly an even higher platform above the proscenium. When the genre of 'New Comedy' was introduced in the middle of the second century, stage conventions placed greater demands on individual performers whereas the use of the orchestra was reduced. This led to the need for a raised stage which would serve performers with a suitable location from where they could address the audience. This led to a preference for the raised stage which provided performers with a better position to address the audience with greater authority.[86]

Greek tragedy derives from religious rituals and its stage design supports a specific form of spectatorship.[87] Rehm notes that in contemporary theatre venues "the spectator is a hidden observer looking in on a specified location through an invisible fourth wall. The

[86] For illustrations, see e.g. Hines 2008; Porter 2009; Crane 2009.

[87] Aristotle tells us that ancient Greek tragedy derives from religious rituals. In Poetics (3.3) he identifies its source in the *dithyramb*, an improvised form of singing and poetry performance which accompanied the orgiastic cult of Dionysus (Aristotle 1971). The original city performances of dithyrambs and tragedies took place in the *orchêstra*, an area set aside for dancing, in the open space of the agora, the busy market which developed at the foot of the Acropolis hill in Athens (Rehm 1992). The dithyrambic and tragic performances were later moved to the south side of the hill and it is known that a tent-like construction, the *skene*, was built at the back of the circular area, to facilitate costume changes, exits and entrances out of sight from the audience.

Greek theatre aims at precisely the opposite effect, a sense that the audience has gathered in a public place to be addressed, and confronted, by the play" (1992: 37). He also remarks how the accepted convention of using masks in the tragedies formed a way of acting, which brought the audience's imagination into play very actively: "as the spectators fill out the fixed visage of a tragic character caught in radically changing situations" (ibid.: 41). The practical purpose of the masks was to allow a single actor to play multiple roles, ages and genders in the same play, but they also provided mystery and dramatic power. In tragedy, head movements are, for example, very frequently used to indicate the arrival of a new character. Rehm writes that these gestures were as powerful as the flash of the naked eye; the masks confronted the audience as well as the human gaze. Contrary to what we may think, "[t]he wide-eyed gaze of the tragic mask does not scatter or divide, but focuses and encompasses, compelling the attention of the entire theatre. Paradoxically, by forcing its gaze out, the tragic mask draws the audience in, for each spectator projects his or her imagination onto its surface." (ibid.: 40f)

In this chapter, I point at the discursive power of art, drama, design and architecture to both *include* and *exclude* spectators and users by means of visibility. In defining the constraints of mediated design, which is my central aim, I must observe how these phenomena apply when we deal with more than real spaces. I use examples from Greek theatre design to sketch analogies applicable to our current attempts to design for presence.

Vitruvius writes that *skenographia* was invented by Agatharcus of Samos as a form of theatrical scene painting or architectural representation to create a stage for Aeschylos' tragedies. Agatharcus "left a commentary about it" but it was Democritus and Anaxagoras who elaborated on the subject (Vitruvius 2001: VII.198). Vitruvius refers to *skenographia* as a kind of architectural drawing in which "given a centre in a definite place, the lines should naturally correspond with due regard to the point of sight and the divergence of the visual rays, so that by this deception a faithful representation of the appearance of buildings might be given in painted scenery, and so that, though all is drawn on a vertical flat facade, some parts may seem to be withdrawing in the background, and others to be standing out in front." (ibid.) Vitruvius provides detailed descriptions and measures of the design of theatres to provide all spectators with a good view of the performance on the orchestra, which also contains "places reserved for the seats of senators" (ibid.: 146). Summers writes that for Vitruvius, the ideal spectator (perhaps Augustus) is placed in a fixed, axial, and at the same time, optical relation to the central "royal door" of a theatre (ibid.; cf. Summers 2003: 489). Summers argues that Vitruvius had a relatively small painting in mind when he refers to lines which respond to the centre point of a compass (*centrum, kentron*), the result of which is "that all diagonal lines from the inner faces of an elevation converge to a single centre" (Summers 2003: 513). This allows us to compare Vitruvius' guidelines with later representational techniques and devices, such as Alberti's *reticolato*. Eventually, visual imagery (scenery) was painted on the *skene*. There may have been projecting wings on either side of the stage building: the *paraskenia* (beside the *skene*). Between these two wings there may also have been a low platform or stage, connected to the orchestra by a few steps. Edward Castronova has suggested that this structure, which is called the *proskenion* ('in front of the *skene*'), is arguably the first physical space designed by humans "explicitly to serve as some other place, indeed a place that exists only in our imaginations" (2005: 10).

In contemporary theatre, the *proscenium* denotes the area on stage which is outside the curtain and in front of the audience. Other terms in theatre discourse will help an actor place himself or herself on-stage or off-stage, i.e. within or outside the visible frame seen by the audience. What is noteworthy here is that actors and audience share the same real space. Similarly, concepts have emerged in other visual practices, such as film, as design tools which denote what was excluded from the eye of the observer. As presence design emerges as a mixed practice between both visual and performing arts, it is important to find applicable concepts.

Drama and theatre design adds a particularly interesting dimension to the realm of designing for visibility and gaze, since a spectator's response to a dramatic performance is

naturally affected by the arrangement of theatrical space as well as by the narrative content of the performance. As we have seen above, concepts derived from Greek theatre design denote on-stage and off-stage spaces – conceptual design tools also used by the authors of the tragedies. This may be discussed as an interplay between different elements of design, only some of which are tangible and relative to real space. Similarly, we may discuss how a spectator (or user) of mediated spaces will respond to the interplay between architectural design of juxtaposed real and virtual spaces and the dialogic interaction at hand. This can be illustrated by Nietzsche's *The Birth of Tragedy* (1872), which describes classical Greek tragedy as the dialogic interaction between the contrasting gods Dionysus and Apollo: "a Dionysiac chorus which again and again discharges itself in Apollonian images. Those choric portions with which the tragedy is interlaced constitute, as it were, the matrix of the dialogue, that is to say, of the entire stage-world of the actual drama." (1872; 1956: 56). Through his address, Nietzsche foreshadows a discussion in which I will currently engage, concerning spatial designs that support an active spectatorship. While these concepts, throughout the later chapters, will be discussed in relation to my design examples (e.g. the notion of *offscreen space*) the aim here is to establish a historical and theoretical framework of the concepts of shared mediated space and active spectatorship, as they have emerged in related visual practices.

40. The Proskenion of the theatre at Priene, Turkey. The proskenium is longer than the skene and has twelve Doric half-columns. Traces of red and blue paint have been found on these. The spaces between the columns were often filled with painted wooden panels as scenery. (Photo: Hines 2005)

41. The theatre at Priene, Turkey. Scholars debate whether the original structure had stone seating, an orchestra of packed earth and a wooden skene. A stone skene dates from ca. 269-250 BC. (Photo: Hines 2005)

Brecht's epic theatre & Artaud's theatre of cruelty

In terms of spectatorship, Bertolt Brecht's epic theatre is an extreme. It encourages critical thinking on behalf of the audience, yet avoids any kind of immersion. Although often performed on a conventional stage, Brecht's ambition to induce critical engagements with social reality was clearly expressed in the text, and also very suitable to a circular stage. It is well known that during rehearsals Brecht often insisted that actors prefix their lines by stating 'he said' or 'she said' to encourage the actors to step out of character. This was as

much for the sake of the audience as for the actors, since the critical education of the former was part of Brecht's ambition.

The work of the French writer and drama theorist Antonin Artaud provides a stark contrast to Brecht's anti-immersive techniques. Artaud's drama has been labelled a 'theatre of cruelty' because of its impact of almost unbearable intensity on the spectator. His stage design often surrounds the spectators, in a form that reconciles immersion and interaction to induce a trancelike involvement in the audience. Ryan suggests that some of the means Artaud used anticipated many of the themes of cyberculture (2001). Firstly, she points at the renewal of linguistic form which can be noted in Artaud's wish to liberate theatre from the hegemony of the spoken word, stressing the need for theatre to become a new bodily language based on signs rather than words. Secondly, she mentions Artaud's vision of creating a 'poetry of space' through stage design. Thirdly, she stresses his ambition to create a multi-sensory, multimedia event; and finally points at the fact that Artaud often places the spectator at the centre of the theatre, quoting him in saying that he wants to do away with stage and auditorium altogether. Artaud's vision of direct contact between spectators and performers has had many followers, and Ryan describes several such participatory productions where the audience is invited to join the actors on stage. Most often, she states, the actors are still in control of the performance, and it may be towards the end and as a kind of conclusion to a ritual, when the audience partakes in a chant or a song. The alternative is to coach the audience to actually carry out the performance, in which case there are literally no spectators to speak of. In Ryan's words: "the play will be staged for the benefit of its own participants." (305) Yet another alternative is to reverse the roles of spectators and performers, so that actors become their own audience, an idea which flourished in the political street theatre of the Vietnam war and civil rights era. Ryan concludes that "When performing becomes synonymous with living, the theatrical experience inherits the immersive and interactive qualities that define our experience of being-in-the-world." (305) It is through such a fusion of life and representation that Ryan suggests theatre anticipates the customized virtual worlds of our current electronic media and its plethora of artistic experiences designed for individual users.

So far, I have observed features incorporated into stage design and the language of drama that support an active spectatorship and experience of presence. Such performances are (most often) limited in time and space, at least in comparison to architectural spaces, which (most often) are designed to last longer. In the following sections I continue this discussion, using examples and design features that similarly support activities which are not intended to last forever, yet enable a sense of presence and dialogic interaction.

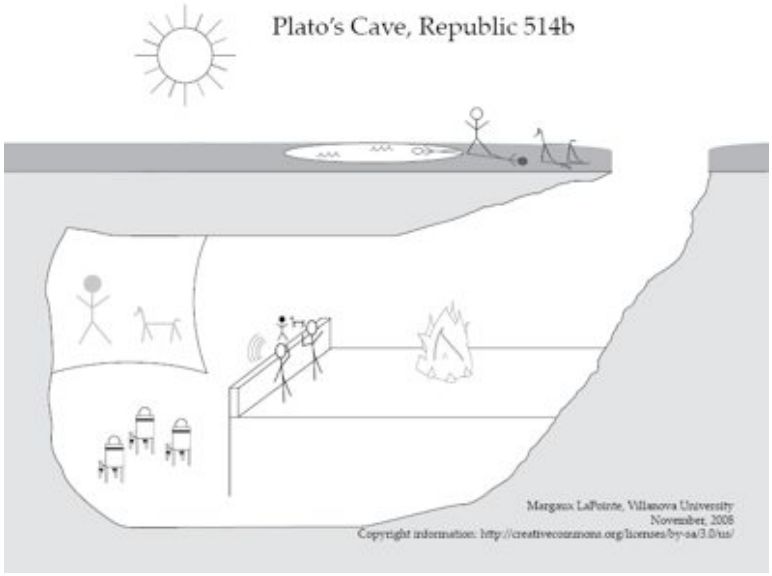
Concepts such as immersion and interaction may be used in relation to architectural design, but this is a complex issue. It must, however, be dwelled upon in order to discuss the design of mediated spaces. Could we, for example, refer to Russian minister Grigori Aleksandrovich Potemkin as a presence designer of his time?

Potemkin took the initiative to design mediated spaces with the aim to impress Empress Catherine the Great in the eighteenth century. Between January and July 1787, Potemkin took Catherine the Great on a long tour through estates he had recently captured from Poles and Turks. Aiming to show what Russia might become under the enlightened Empress, he had begun – but not completed – the urban transformation towards building a vast stage for his utopian visions. He now wanted to present the scenery of an idealised new Russia and display a well-functioning society in full splendour. As shown by several scholars (e.g. Cronin 1978; Alexander 1989) many of these so-called 'Potemkin villages' were simply rows of wooden facades and stage scenery constructed to give an impression that one was passing through an already flourishing estate. Although never fully executed, we may conclude that the virtual architectural representations sufficed, and according to Werret (1999), Potemkin's stage sets impressed Catherine just as much as real estates. Foreign guests in the royal entourage who participated in the tour were, however, convinced that the villages were stage sets constructed to deceive the Empress into believing that Potemkin had achieved more

than he had. Werret suggests that what these guests failed to appreciate was that the villages were part of a natural theatricality integral to Russian culture.

Suggesting, along with Ryan, that the history of visual media as a whole may be described in terms of "balancing immersion-seeking and interaction-promoting moments", I will discuss how this is resolved within architecture and spatial design (e.g. workplace design) in order to subsequently discuss mediated design in this light. Let me, in the following, show how these phenomena emerge through early cinematic media, specifically the concepts of *spectatorship* and *filmspace*. As we will see, the projection techniques used are quite similar to those my colleagues and I use in our contemporary practice of presence design. As previously noted, there is a significant difference in that our architectural extensions take place in real time, facilitated by transmission technology. Nevertheless, applicable aesthetic concepts can be found in the origins of presence design.

Optical phantom projections & phantasmagoria



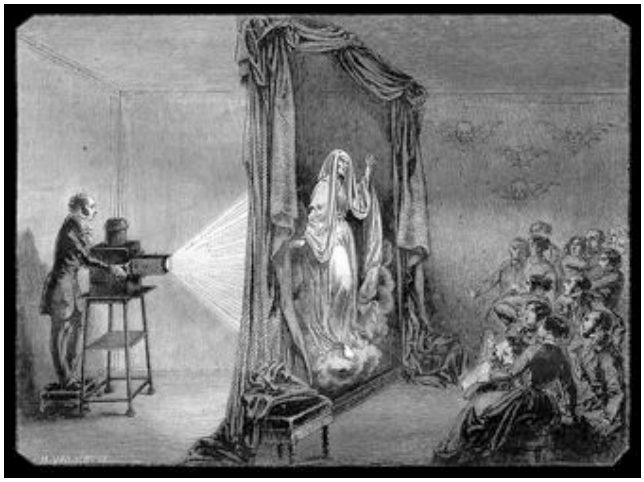
42. An illustration of Plato's cave. Illusion and appearance versus reality: the projection from the sun, the light from the fire, the shadows on the wall, the objects that cast the shadows, etc. (LaPointe 2008)

This chapter would not be complete without mentioning the proposed design, by Plato, in Book VI of his *Republic* as an allegory of illusion versus reality. To call this a design is perhaps unconventional, but Plato did refer to the projection from the sun, the light from the fire, the shadows on the wall, the objects that cast the shadows in combination, possibly as it is illustrated above. Plato's allegory of the cave may be considered an original source of mimetic representation in Western civilization (ca. 366 BC) and as such it allows me to introduce this section on phantasmagoria and early visual media.

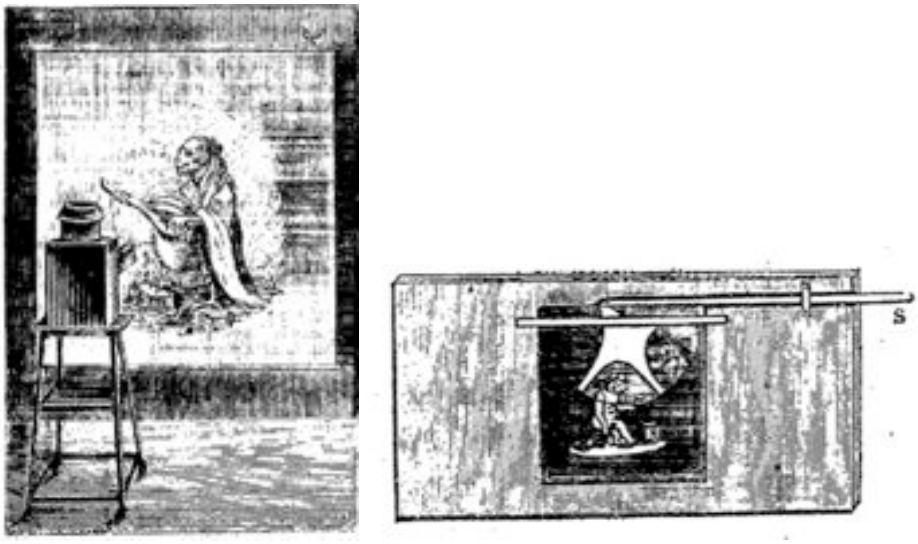
Apparentia nocturna ad terrorem videntium was the name which Giovannie da Fontana, a young Venetian academic, gave a device he invented in 1420, aiming to frighten people by using optical trickery and projection. Fontana painted demonic shapes on a lampshade and used it to create grotesque shadows on a wall.

43. 'Apparentia nocturna ad terrorem videntium' by Giovanni da Fontana, ca. 1420. In his extensive overview of early visual media, Robinson (1997) suggests that nearly two centuries passed before image projection "acquired the magic of precise representation". The origins of the magic lantern - combining a light source, a light condenser, an image painted on glass and a lens is credited to the Jesuit scholar Athanasius Kircher, who described such a device in his 1671 tome 'Arts Magna Lucis et Umbrae' (The Great Art of Light and Shadow). Dutch physicist Christian Huygens may also have used a practical magic lantern as early as 1659.

In the turbulence around the French Revolution, the phantasmagoria ghost shows can be seen as the height of ghost effects created with optical trickery and projection, as shown below.

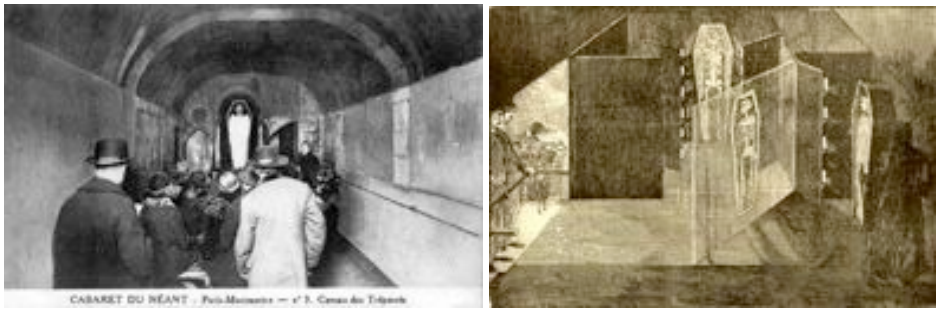


44. A Phantasmagoria room as illustrated by the optician M. Richebourg in the French journal 'Magasin Pittoresque' (1849: 53). The use of back-projection on a translucent screen is clearly demonstrated. A visitor who attended a 'séance fantasmagorique' in 1798 designed by E. G. Robertson in a very brightly lit Parisian flat on 18, Rue de l'Echiquier, gave the following account, reprinted by the journal Magasin Pittoresque in 1849: "Un jeune merveilleux sollicite l'apparition d'une femme qu'il a tendrement aimée, et alors il montre le portrait en miniature au fantasmagorie, qui jette sur le brasier des plumes de moineau, quelques grains de phosphore et une douzaine de papillons; bientôt on aperçoit une femme les cheveux flottants et fixant son jeune ami avec un sourire tendre et douloureux..." (Charton 1849: 51 based on Robertson; e.g. 'Mémoires récréatifs, scientifiques et anecdotiques du physicien aéronaute', 1831)



45. An illustration of Robertson's *design for 'Les tableaux transparents' (transparent paintings) which also appear in Charton with the caption: "On voit qu'en tirant la tige S, l'enfant souriant que la figure représente, deviendra un monstre à tête d'oiseau. C'est que, dans le mouvement, une partie de verre, actuellement dans l'ombre, viendra en pleine lumière à la place d'une autre partie chassée a son tour dans l'obscurité." (Charton 1849: 53)*

The True History of the Ghost and all about Metempsychosis was the title of a book published in 1890 by a 'Professor Pepper'. An illustration of Pepper's theatrical effect created by means of different projection techniques is seen below:



46. Illustration of the 'Pepper's Ghost effect' at the Cabaret du Néant in Paris. (Weinant 2003)

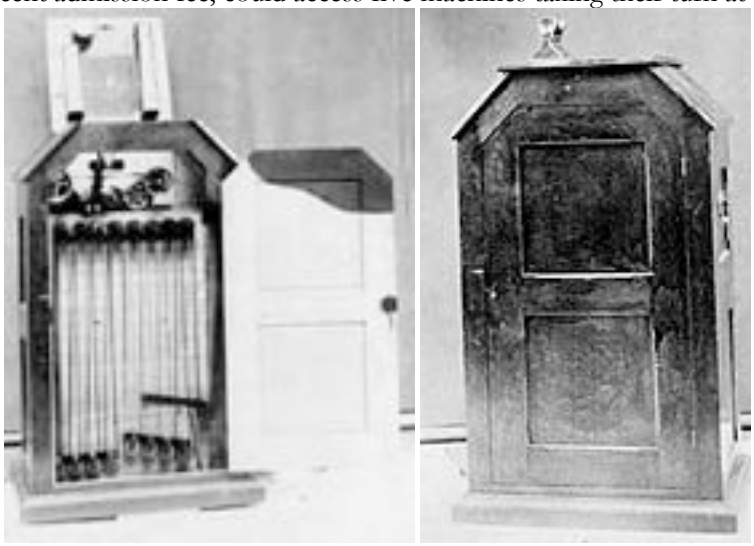
The picture to the right explains the optical arrangement of the *Pepper's Ghost effect* and the transformation of a person into a skeleton. When the man (dressed as a ghost) inside the coffin is strongly illuminated, the spectators see him through a sheet of glass. As this light is reduced, a skeleton appears on the glass (by means of back-projection from a device called phantascope*)*. The spectators thus witness a transformation: a ghost-person in a coffin becomes a skeleton in a coffin. Because of the glass, the skeleton in the coffin is seen in exactly the same position as the man, dressed up as a ghost. By a reflection in the 45° glass plate, the audience sees the ghost and, at the same time, the actor with a sword through the glass.

All these examples point to an enduring aspect of presence design technologies – namely, a fascination with the uncanny and with the liminal states between materiality and immateriality, between life and death, between being and non-being, and between being *here*, or *there*.

The birth of cinema: Kinetoscopes and Vitascopes

Cinema was the first technology to render moving images using photographic technology. The kinetoscope was a device into which a spectator could peer at such moving images. It was designed by William Kennedy Laurie Dickson at the Edison Laboratories and an early

prototype was shown at the National Federation of Women's Clubs in 1891, and would later become the first animation device which Thomas Edison patented, in 1892 (Starker 1991). In 1894, ten peep-show machines were exhibited in New York where spectators, for a 25-cent admission fee, could access five machines taking their turn at the peepholes.



47. Edison's Kinetoscope open and closed. The viewer would look through the lens at the top of the machine to watch a film. (American Library of Congress 1892)

The images were recorded on 18 mm wide celluloid film which ran horizontally between two spools at a continuous speed. A rapidly moving shutter provided intermittent exposures when the device was used as a camera, and intermittent glimpses of the positive print when it was used as a viewer:

> A large, electrically driven sprocket wheel at the top of the box engaged corresponding sprocket holes punched in the edges of the film, which was thus drawn under the lens at a continuous rate. Beneath the film was an electric lamp, and between the lamp and the film a revolving shutter with a narrow slit. As each frame passed under the lens, the shutter permitted a flash of light so brief that the frame appeared to be frozen. This rapid series of apparently still frames appeared, thanks to the persistence of vision phenomenon, as a moving image. (Robinson 1997: 34)

Kinetoscopes very quickly became popular and were soon distributed across the United States, offering boxing-matches and vaudeville acts with the addition of nickel coin boxes on each machine permitting spectators to choose which film they would like to see. As pointed out by Robinson, one element in the motion picture puzzle was still missing: projection (ibid.). Projection was required to create a collective, rather than an individual, experience.

William Kennedy Laurie Dickson, who was Thomas Edison's assistant, had sought copyright protection as early as 1893 for a number of kinetoscopic records, i.e. motion pictures made for commercial use with the kinetoscope. According to Robinson, Dickson's copyright marks the true beginning of cinema and film industry, predating by more than two years the projection of a film before a paying audience in Paris on 24 December 1895, which is widely referred to as the birth of public cinema.

The single-user kinetoscopes were very profitable and Edison had little interest in developing a projection system. He discounted the notion of projecting images onto large screens for mass viewing. According to Starker (1991), it was a strike of New York city vaudeville performers who in 1901 suggested to theatre managers that films might be substituted for live acts. They soon discovered that projected movies could simplify their business practices and reduce their expenses, while continuing to attract large audiences. Greater audiences would generate higher profits since fewer machines were needed in proportion to the number of viewers.

48. Advertisement for the Edison Vitascope motion picture projector, marketed by the Edison Manufacturing Company, even though it was invented by Thomas Armat and C. Francis Jenkins. (Robinson 1997)

It is well known that Edison attempted to link the kinetoscope images to recorded sound in what he called the kinetophonograph: "an instrument which does for the Eye what the phonograph does for the Ear", but which failed (Robinson 1997: 23). By the end of 1894, it was clear that the kinetoscope was out of step with the public's enthusiasms. It faded into obscurity, along with peep shows, to be replaced by other innovative visual technology. A number of fairly similar projection devices were invented around 1895, following a fierce competition between American, English and French manufacturers. The American innovation process including the different devices that followed (e.g. the mutoscope, biograph, eidoloscope, phantoscope, and vitascope), which are well documented.[88] Though the biograph was first to be on the market, the projection victory went to the Edison Vitascope, which was publicly displayed on April 23, 1896, at Koster and Bial's Music Hall in New York City, marketed as 'Thomas A. Edison's Latest Marvel' (Robinson 1997).

Presence and spectatorship in cinematic spaces

As shown by many historians, it would take almost ten years before films were shown in a context of their own. They were little by little integrated into existing social spaces and exhibition outlets such as vaudeville theatres, museums and world fairs.

Towards the end of the century, Vaudeville shows sometimes included short films as a new type of act, while other theatres just used films as 'fillers' between live shows. 'Peep-show arcades' created improvised 'cinematic theatres' by hanging a sheet to display film and putting out some chairs. Edison and his competitors were increasingly selling improved and less expensive projectors so that eventually they were affordable to most playhouses, as well as arcade owners (Starker 1991: 90).

[88] Cf. Zimm 2005; Fullerton et al. 2001; Jenkins 1975; Starker 1991; Robinson 1997. Dickson resigned from Edison's company in 1895 over a bitter dispute regarding authorship and the direction of the technology. He immediately formed a new company with new partners and patented the mutoscope, a device to project moving pictures. This was perfected into a projector called the biograph, which was first to reach the market. Dickson's company (later named the 'American Mutoscope and Biograph Company') was soon a major competitor to the Edison Company. Another engineer who led the way was Woodville Latham, who created the eidoloscope projector together with his sons, a device which was also presented publicly in April 1895. In parallel, C. Francis Jenkins and Thomas Armat, two students at the Bliss School of Electricity, developed a motion picture projection device which they called the phantoscope. This was publicly demonstrated in Atlanta in September 1895 and although this partnership fell apart, several manufacturers recognized the potential of the phantoscope in the face of declining kinetoscope business. The Edison Manufacturing Company was interested in the machine and agreed to produce films for it on the condition it was advertised as a new Edison invention and marketed as the Edison Vitascope.

Although the technique to project images was now available and permitted the cinematic experience to be collectively shared, there remained the issue of how to provide spaces which could adequately support this experience. As Kristen Daly has recently shown in her doctoral thesis 'Cinema 3.0: How Digital and Computer Technologies are Changing Cinema', this design issue is also a key factor to the emergence of a new visual culture (2008: 34ff)

During the first few years, a major attraction of cinema was often the technology itself; and although the vaudeville was the principal exhibition outlet, films were frequently displayed as technological inventions in world fairs, museums, amusement parks and circuses (Persson 2001: 39).

One example which illustrates the interest in new media technology is the Stockholm Art and Industry Fair of 1897. This attracted an unprecedented 1.5 million visitors over six months and played a crucial role in fostering modernity in Sweden, introducing the language of new visual media to a large audience (Ekström 1994; Ekström et al. 2005; Sörensen 1999). A pavilion city was designed which in form and content expressed the high architectural, technological, and artistic ambitions of modern Swedish society. The fair included a half-scale replica of the medieval city of Stockholm and it was in this mediated historic setting that spectators were exposed to modern inventions. The interiors of these 'medieval townhouses' were furnished as coffee shops, restaurants, an 'x-ray laboratory' and Sweden's first cinematic theatre. By exaggerating the perspective and reducing the scale of buildings, an illusion of historic context was created and enhanced by actors (in medieval costumes,) who populated the streets and squares. Real building materials were used in combination with stage set constructions. I describe this in more detail as part of the *Mediated Museum* design example, at the end of Chapter 5.

One of the films in the cinematic theatre of the fair featured King Oscar II during his inauguration of the fair in May 1897. Ekström et al. (2005) use this example to illustrate the narcissistic aspect of the fair, which they suggest is symptomatic of a nation 'on the threshold of modernity'. Not only were spectators exposed to a new visual media, they also encountered this media inside a specific setting which hade been designed to augment their experience. Finally, with direct reference to presence design, visitors witnessed how King Oscar II, in a different temporal, but identical spatial location, inaugurated the event, pointing towards modernity. Within a few hours after his 'real' appearance, and a few hundred metres further away, visitors were able to witness the King's 'virtual' presence at the fair, from inside Sweden's first cinematic theatre.

49. Film clip showing the arrival of King Oscar II to the fair. Excerpts from 'Jubileumsutställningen 1897' (Swedish Television open archive). Inside Sweden's first cinematic theatre, built in a part of the fairgrounds called 'Olde Stockholm' (see Chapter 5, the Mediated Museum), visitors were able to view short films of events at the fairgrounds the very same afternoon as they had taken place.

It was not until the *nickelodeon* boom of 1905-06 that films were shown in a separate context of their own (Persson 2001). Eileen Bowser writes that by 1908, there were approximately 8,000 nickelodeons in the US In contrast to the vaudeville theatres which had showed many actuality films, nickelodeons were new storefront theatres featuring more fictional films

(Bowser 1994). Appearing first in 1905, nickelodeons, which featured movie shows all day long and soon spread across the US The theatres attracted a wide clientele, including women and children, and the frequent showings allowed people to stop in almost anytime, unlike variety theatres. By the end of 1907, however, the nickelodeon boom began to decline, and entrepreneurs began to build movie theatres with larger seating capacities where larger audiences could watch longer film programmes.

50. Interior of a nickelodeon theatre in Pittsburgh, Pennsylvania, claimed to be the first in the United States. It was built in Pittsburgh in June 1905, by Harry Davis, a vaudeville magnate. ('Edison Films & Projecting Kinetescopes' 1907: 629)

Space in film – film space

As seen above, the new cinematic media was modelled on earlier visual practices that supported dialogic interaction. This means that the first spaces for film, as well as the spaces in film, *film spaces,* were relatively interactive.

Early cinema featured travelogues, panorama films, newsworthy events as well as fiction. During the first ten to fifteen years, the projectionist often assumed the role of lecturer and provided a verbal commentary to the film. This mimicked the slide lecture, an important genre at the time, not only in vaudeville theatre but also in museums, fairs and churches. A block of films was often inserted into an evening programme, together with performances of singing, dancing and conjuring tricks.

Scholars such as Per Persson and Tom Gunning have observed that cinema thus emerged as a social, rather than an individual, experience and that the fiction genre was modelled on the vaudeville (Persson 2001: 40f; Gunning 1994: 261). To understand how this cinematic space was understood and received we must observe the constant communication that early cinema instigated within its spectators, as well as the spatial dimension of the auditorium that facilitated the interaction.

51. Film clip from the very end of 'The Great Train Robbery', illustrating the concept of mediated gaze in film. The film was directed and photographed by Edwin S. Porter and is one of the Edison Company's most famous films, produced in 1903. Towards the end of the film, the robbers are counting their money in the forest (left). The sequence includes a widely known close-up shot of Justus D. Barnes in the role of the outlaw, who looks straight at the camera, a scene modelled on the vaudeville, that could be shown at the beginning or end of the film (right). Because of its immediate success, a remake of the film was released in June 1904 by motion picture manufacturer Sigmund Lubin. (Porter 1903)

In his analysis of spatial practices in early visual media, Persson uses the example of *The Great Train Robbery* to illustrate the many similarities between early cinema and the vaudeville (2001: 40f). He points at similarities between early cinema and vaudeville, and stresses the social and interactive aspects of early cinema by presenting the following arguments:

(1) As in vaudeville, characters in the film frequently acknowledged the presence of spectators by looking straight into the camera and gesturing towards them. This practice - of mediated gaze - erased the division between stage/screen and auditorium space (which may be compared to circus, stand-up comedy or televised news) thus adopting a manner already established in vaudeville.

(2) Persson suggests that theatres and nickelodeons were not as dark as they are today: "Whereas today's total darkness effectively 'erases' the auditorium space, early cinema treated screen space and theatre space as one and the same".

(3) In a typical vaudeville manner, the scenery was composed of flat painted backdrops thus creating a contrast between actors and background.

(4) Persson furthermore refers to the camera work of the vaudeville, stating that there is, in a way, no camera work to speak of. The camera was considered a replacement of the spectator in the theatre seat, which meant that both camera movement and editing were rare. As in theatre, therefore, all action was presented without fragmentation or disruption of the time/space continuum of the single shot.[89]

(5) As a direct consequence of the vaudeville context, Persson states that early cinema-makers used very long shots/sequences where whole bodies and objects were contained within the frame: "Thus, in early cinema all 'scene' space was contained within the 'screen' space. Nothing of the action or the objects in the scene overlapped the 'off-screen' space. The fictive space did not continue beyond the edge of the screen, but was like a self-contained box, very much like a theatre stage. The space immediately outside the frame belonged not to the fictive world, but to the space of the theatre (which, again, was not entirely dark)." (Persson 2001: 42). In consequence, this conceptualisation of space was often described as grotesque and vulgar, because feet, waist or neck were often chopped off in closer framings of characters.

Whereas the previous section has stressed the close relationship between early cinema and vaudeville, our continued discussion will emphasize that the arguments presented above concern design issues closely connected to the new visual practice of cinema as it emerged. The new practice involved sharing (new) cinematic spaces that were (as nickelodeons and

[89] This 'respect for wholeness' is also reflected by the terminology used: contemporary filmmakers and scholars use the term 'scene' to denote a segment of a narrative film that takes place within the same spatial location, whereas 'shot' or 'take' signifies one interrupted run of the camera. Before the 1920s, however, every shot was called a scene (Bordwell et al. 1985: 66).

world fairs) either intentionally designed buildings, minor or major adaptations to existing spaces, or fully redesigned interiors.

In terms of my continued discussion regarding 'shared mediated spaces', we can therefore make a distinction between sharing a real space, and sharing a mediated experience inside a shared space. Both kinds are included in Persson's argument above, which I suggest contextualises the new cinematic media by specifically addressing its design aspects. The first point relates to the design of spaces where the films were shown. The second relates to the design of space inside a film (film space), including the direction of actors' movements and gaze through space and time, as well as how film-making and camera technique were used as design tools in developing a narrative.

As shown in earlier sections, not all scholars will provide a design perspective as they analyse a representation in architecture, art, media or film. A film theorist need not include a discussion of the Pittsburgh Nickelodeon to assert the aesthetic qualities of *The Great Train Robbery*; neither does an art historian always address the architectural or religious context to which a mural belongs. A practising architect and designer will, however, find it difficult to exclude the spatial and temporal setting in which an object is consumed or even produced.

The themes raised thus far regarding gaze, shared space(s) and their design constraints are further explored in the following section which observes presence in the textual world. My aim is to discern concepts which are used in one aesthetic practice and to discuss their applicability and relevance – a hundred years later – in another emerging visual practice: that of designing mediated spaces.

PRESENCE IN THE TEXTUAL WORLD

A notion of presence also exists in literature. As an example of visual immersion across time and space, I will refer to the French author Denis Diderot, who provided vivid accounts of walks in various landscapes that he claimed to have visited. His written depictions of these *promenades* were very expressive and included detailed descriptions of different sites (Diderot 1767, 1969). As noted by many scholars, Diderot emphasized the rich and immersive experience evoked by these landscapes.[90] These *sensations délicieuses* rendered Diderot completely oblivious to time, as he was fully present in the moment:

> I was motionless, my eyes wandered without fixing themselves on any object, my arms fell to my sides, my mouth opened. My guide respected my admiration and my silence; he was happy, as vain as if he were the owner or even the creator of these marvels. I shall not tell you how long my enchantment lasted. The immobility of beings, the solitude of a place, its profound silence, all suspend time; time no longer exists, nothing measures it, man becomes as if eternal. (Diderot 1767: 134-35, as translated by Fried 1980: 125)

However, at the very end of Diderot's written account of this promenade, passing through the sixth site of the landscape, he finally admits that all along, he was actually describing new paintings by Claude-Joseph Vernet. To fool the reader, Diderot had only imagined the walks, pretending that he walked straight into a landscape painted by Claude-Joseph Vernet.

52. Landscapes by the French painter Claude-Joseph Vernet from 1766, exhibited at the Paris art exhibition of 1767: 'Salon III', listed as "Plusieurs Tableaux" under No. 39 in the exhibition catalogue.

Diderot's text was in fact an art review and appeared in the *Salon* in 1767, a publication series which reviewed recurrent art exhibitions organised by the *Académie Royale de Peinture et de Sculpture* at the Louvre, and which, all in all, appeared nine times between 1759 and 1781. Diderot was commissioned as its editor and became, in effect, a self-made art critic. P. N. Furbank refers to Diderot's writing – as it emerged through the Salon of 1767 – as a 'literary invention' (1992: 285).[91]

Commenting on his own fiction, Diderot claimed that just as he was about to write a review of Vernet's work, he was invited to stay with friends near the seaside. In this French chateau, as described by Furbank, the resident tutor, an abbé, asked Diderot to join him for a walk with his two young charges, in order to enjoy the splendours of the countryside: "As they walk in this sublime and mountainous landscape they argue about the relative merits and rights of art and nature and about how, if Vernet teaches one to look at Nature better,

[90] See e.g. Furbank 1992: 285ff; Fried 1980: 123ff; Carrier 1988: 419f.

[91] In comparing the two major set pieces in the 1767 Salon (the sections which refer to Joseph Vernet's landscapes and to Hubert Robert's studies of ruins) Furbank concludes that these may be equated with journeys: journeys in space – Vernet – and journeys in time – Robert (Furbank op. cit.: 286f). Cf. Alexandra Wettlaufer, whose recent book *In the Mind's Eye: The Visual Impulse in Diderot, Baudelaire and Ruskin,* yields a fruitful analysis of the above (2003).

Nature for her part may teach one to look at Vernet better." (1992: 286) The point is that the walkers, in the course of their promenade, were actually following the contours of a painting exhibited in the Salon. In addition, they were also observing the view from a different viewpoint than the one Vernet established in the canvas. As Furbank notes: "Thus fiction has been folded within fiction and paradox within paradox, a double confusing of art and nature." (ibid.)

Diderot explains why he adopted the fiction that these were real scenes: he wanted to break the boredom and monotony of the descriptions, "pour rompre l'ennui et la monotonie des descriptions" (1767: 159).

According to Fried, Diderot developed this technique both to encourage a reader to see the landscape painting through his eyes, but also to visualize his own presence in the scene: "Diderot portrays himself as if he were a figure in the painting." (1980: 125) Furbank stresses Diderot's own presence and refers to the text as "a delicious reverie", but with the reservation that "his eye and mind are neither on a real landscape, nor on a painted one, but on himself" (1992: 287).

Fried notes that Diderot used this "fiction of physically entering the painting as a nonjudgmental descriptive technique", but that this sometimes failed (1980: 227). Fried quotes Diderot:

> I go on my way, I leave the musician reluctantly, because I like music and because this musician has an air of enthusiasm that captivates. On my right a space opens up, through which my eye wanders in the distance. If I went further I would enter a grove; but I am stopped by a large pond that forces me out of the canvas. (Diderot 1767: 211, as translated and quoted by Fried 1980: 227)

Annoyed that some sorts of paintings did not allow him to immerse himself, Diderot would also blame the painters if they were not sufficiently skilled. Fried quotes Diderot complaining that

> …the objects in it are so unfinished, so indeterminate, that we really do not understand anything (...) if he continues to neglect drawing, color, and details, inasmuch as he will never attempt any of the subjects that attract the beholder of the action. (Diderot as translated and quoted by Fried 1980: 226)

A reader of a book forms mental images in a way that contributes to an immersive reading experience. Marie-Laure Ryan defines three forms of involvement with narratives: spatial immersion (the reader's response to a setting or an artefact, such as the famous Proustian 'madeleine effect'); temporal immersion (the reader's response to a plot); and emotional immersion (the reader's response to character) (2001: 121ff). She also refers different ways in which language and grammar are used to evoke a sense of presence, or "to channel the attention of the audience towards certain events and create a profile of mounting and declining tension", such as switching from past and present tense, from first to second-person narration (ibid.: 136ff). These may be seen as different techniques that a writer uses, in the attempt to evoke, i.e. to design, an experience of immersion.

What about interactivity and the notion of an active spectatorship, or in this case, readership, in the textual tradition? The oral tradition, historically, provided us with the most obvious interactive form of storytelling. A much-quoted example of interactivity is Italo Calvino's *If on a Winter's Night a Traveller,* where the reader is directly addressed in the text (1982). Throughout the text, Calvino uses different techniques to obstruct the reader's immersive experience. As a result, a reader must repeatedly reformulate the mental images.

Inspired by computer-programming, French writer Raymond Queneau experimented with interactivity in text in his *A Story as You Like It*, which invites the reader to become the designer of narrative:

> 1. Do you wish to hear the story of the three alert peas?
> if yes, go to 4

if no, go to 2

(...)

4. Once upon a time there were three peas dressed in green who were fast asleep in their pod. Their round faces breathed through the holes in their nostrils, and one could hear their soft and harmonious snoring.

if you prefer another description, go to 9

if this description suits you, go to 5

5. They were not dreaming. In fact, these little creatures never dream.

if you prefer that they dream, go to 6

if not, go to 7

(...) (Queneau in Motte 1986: 156)

Queneau, in many ways, foreshadowed hypertext, illustrating the over-abundance of choices that a reader confronts in interactive texts. One may object to this form because a reader never knows 'what is around the corner'. It may however be argued that Queneau leaves the reader to make his/her own choices and, in effect, to take command of the text in ways that transform the consumer into a producer, such as is often discussed in relation to 'new media' (e.g. Lister 2003; Cost 2005).[92]

To weave the discussion about spectatorship and the design of performance spaces into the forthcoming discussion about the contexts of exhibition and museum, I will quote Boris Groys, who comments on the confusion that a contemporary spectator faces as he or she enters a museum:

> The visitor to a video installation basically no longer knows what to do: Should he stop and watch the images moving before his eyes as in a movie theater, or, as in a museum, continue on in the confidence that over time, the moving images will not change as much as seems likely? Both solutions are clearly unsatisfactory – actually, they are not solutions at all. One is quickly forced to recognize, though, that there cannot be any adequate or satisfactory solution in this unprecedented situation. Each individual decision to stop or to continue on remains an uneasy compromise – and later has to be revised time and again. (...) Consequently, the duration of actual contemplation has to be continually re-negotiated. (2008: 89)

The process of digitalization has caused a situation in which our expectations in visiting a cinema and visiting a museum conflict with one another. Groys suggests that there is a conflict between two prevailing models, which both strive to gain control over time, which Groys refers to as the 'immobilization of the image in the museum' and the 'immobilization of the audience in the movie theatre'. When moving images are transferred into the space of a museum, Groys argues that both models fail. In this case, he writes: "The images go on moving – but the audience also continues to move. One does not remain sitting or standing for any length of time in an exhibition space; rather one retraces one's steps through the space over and over again, remains standing in front of a picture for a while, moves closer or away from it, looks at it from different perspectives, and so on." (2008: 88)

Addressing the confusion which results from the increased use of digital images in museum contexts – both on behalf of the visitor (spectator) and on behalf of museum curators – Groys gives a key role to curators in the time of digitalization: "On both sides of the digital divide one feels a certain discontent. On one side, the liberated digital image seems to be subjected to a new imprisonment, a new confinement inside the museum and exhibition walls. On the other side, the art system seems to be compromised by exhibiting digital copies instead of originals." (ibid.: 83)

This contemporary confusion in terms of spectatorship that Groys raises is something that Walter Benjamin observed seventy years earlier. Already in Benjamin's time there were issues linked to the relationship between *original* and *copy*. In the following I will look more closely at the concepts of authenticity, realism, and originality as they have emerged in related visual practices, in order to discuss their role in museum discourse as part of Chapter 7.

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[92] An interesting example is the hypertext writing software *Storyspace* by Eastgate Systems Inc. (www.storyspace.net).

Realism, original and copy: Benjamin's concept of *aura*

> "The presence of the original is a prerequisite to the concept of authenticity." (Benjamin 1936; 1992: 214)

In 1936, Walter Benjamin published an essay in which he discussed the effect of mechanical reproduction on the visual arts. 'The Work of Art in the Age of Mechanical Reproduction' is frequently quoted by scholars who discuss the interrelation of politics, technology and art during the first decades of modernism.[93] Throughout the essay, Benjamin compares the new and powerful media of photography and film to painting and theatre and foresees a new function for art. Through its relationship to new and larger audiences, the new cinematic media reformulates the conditions of artistic practice: "Nothing more strikingly shows that art has left the realm of the 'beautiful semblance' which, so far, had been taken to be the only sphere where art could thrive." (Benjamin 1936; 1992: 224) Benjamin wanted this change, he wanted to erase the distinctions between artist and audience, he wanted new forms to emerge and he wanted a reformulation of the roles of art and artist.

Although it was always possible to imitate manmade artefacts, Benjamin asserts that mechanical reproduction represents something dramatically new. He refers to the Greek practice of reproducing bronzes, terra cottas and coins in great quantities using the founding and stamping techniques, but states that all other works of art were unique and could not be mechanically reproduced.

The new forms of mass communication made possible by the advent of mechanical reproduction fascinated Benjamin. The technologies allowed the reproduction of a word, a picture or a scene and made them accessible to a much wider audience. In combining photography with the technical reproduction of sound, which became possible at the end of the nineteenth century, the emerging film practice brought about a profound change, which had an equally profound impact on the masses:

> For the first time in the process of pictorial reproduction, photography freed the hand of the most important artistic functions which henceforth devolved only upon the eye looking into a lens. Since the eye perceives more swiftly than the hand can draw, the process of pictorial reproduction was accelerated so enormously that it could keep pace with speech. A film operator shooting a scene in the studio captures the images at the speed of an actor's voice. (Benjamin 1992: 213)

Benjamin's argument is that the new cinematic medium forms a new kind of spectatorship, addressing much larger audiences and formulating a new relationship between actor and audience. He compares film to theatre, where an actor actively responds to the audience, both of whom are always present, sharing the same real space, creating a subtle form of interaction, and as a result, each performance is different than the one before. In film, however, there is no audience – only a camera – through which the audience identifies with the actor: "the audience takes the position of the camera; its approach is that of testing" (ibid.: 222). Here he compares the audience to the critic, neither of which has any personal contact with the actor. He stresses this distance created between the artistic performance and the audience through film, noting its 'exhibition value'. This is in stark contrast to the 'cult value' for which traditional works of art were appreciated. It is also in this distinction we may understand the concept of 'aura' withering away.

> [T]his is the effect of the film – man has to operate with his whole living person, yet forgoing its aura. For aura is tied to his presence; there can be no replica of it. The aura

[93] Cf. the introduction by Hannah Arendt in Benjamin 1992; Kazis 1977; Benjamin 2005. At the time of writing Benjamin was aware of the cultural crisis of between-war Germany, which accompanied the rise of fascism. His text must be read in this light. In Benjamin's view, an artist should no longer stand above the social struggle.

> which, on the stage, emanates from Macbeth, cannot be separated for the spectators from that of the actor. However, the singularity of the shot in the studio is that the camera is substituted for the public. Consequently the aura that envelops the actor vanishes, and with the aura the figure he portrays. (Benjamin 1992: 223)[94]

Benjamin's essay provides useful concepts in relation to presence design. His concept of technology is, for example, a broad compound which comprises the artistic practice as a whole, including professional skill, as well as a number of design criteria, some of which relate to architecture and spatial design. Thus, his definition not only refers to the instrumentality – to the 'techne' – of 'technology' but to a wider design practice, which incorporates the audience:

> The shooting of a film, especially of a sound film, affords a spectacle unimaginable anywhere at any time before this. It presents a process in which it is impossible to assign to a spectator a viewpoint which would exclude from the actual scene such extraneous accessories as camera equipment, lighting machinery, staff assistants, etc. – unless his eye were on a line parallel with the lens. This circumstance, more than any other, renders superficial and insignificant any possible similarity between a scene in the studio and one on the stage. In the theatre one is well aware of the place from which the place cannot immediately be detected as illusionary. There is no such place for the movie scene that is being shot. Its illusionary nature is that of the second degree, the result of cutting. That is to say, in the studio the mechanical equipment has penetrated so deeply into reality that its pure aspect freed from the foreign substance of equipment is the result of a special procedure, namely, the shooting by the specially adjusted camera and the mounting of the shot together with other similar ones. The equipment-free aspect of reality here has become the height of artifice; the sight of immediate reality has become an orchid in the land of technology. (1992: 226)

Reading Benjamin's essay today, in the era of digitalization, we may note that several of his forecasts and expectations on the renewal of artistic practice came true during the twentieth century. Although some of the concepts may have played out their role in relation to artistic and curatorial practices today, others are still useful to the argument in this thesis.[95]

Groys quotes Benjamin in reference to the digitalisation process of contemporary museum practices. He reflects that the loss of aura is especially significant in the visualization of a digital image file: "If a traditional 'analog' original is moved from one place to another it remains a part of the same space, the same topography – the same visible world. By contrast, the digital original – the file of digital data – is moved by its visualization from the space of invisibility, from the space of 'non-image' to the space of visibility, to the status of 'image'. Accordingly, we have here a truly massive loss of aura–because nothing has more aura than the Invisible." (Groys 2008: 86) Groys points at the visualization of the Invisible as the most radical form, suggesting that the visualization of digital data may be comparable to the attempt to visualize or depict the invisible God of Judaism or Islam.

Groys writes with reference to asynchronous moving images such as video installations in art museums, but his discussion is also relevant in relation to my architectural extensions in real time. Groys reflects that we could perhaps compare the abundance of digital photographs and videos that confront us in museums today to the ready-mades, analogue films or photographs which were displayed in exhibition spaces in the twentieth century: both trends were accompanied by a significant 'loss of aura' in the work of art. Groys

[94] The new form of spectatorship can also be seen in Benjamin's comparison with painting, where he clearly addresses the novelty in terms of both form and spectatorship: "Let us compare the screen on which a film unfolds with the canvas of a painting. The painting invites the spectator to contemplation; before the movie frame he cannot do so. No sooner has his eye grasped a scene than it has already changed. It cannot be arrested." (1992: 231)

[95] In a well-known essay, 'On the Museum's Ruins', Douglas Crimp refers to Walter Benjamin using the concept of presence: "Through reproductive technology, postmodernist art dispenses with the aura. The fiction of the creating subject gives way to the frank confiscation, quotation, excerptation, accumulation and repetition of already existing images. Notions of originality, authenticity and presence, essential to the ordered discourse of the museum, are undermined." (Crimp 1993: 58)

questions the need to exhibit such large amounts of digital images that museums and exhibition spaces, asking rhetorically: "Why should we exhibit these images at all – instead of just letting them circulate freely in the contemporary information network?" (2008: 83) This is an important question to which Groys doesn't provide a full answer, but which can be answered in design terms. As we know, there is no such thing as 'circulating freely' either on the Internet or elsewhere, since there is always a context in which humans have designed and which conditions our context of use. A central characteristic of the Internet is that it is spatial, and that all symbols, words, and images we see are assigned a specific address. They are, as Groys puts it, "placed somewhere, territorialized, inscribed into a certain topology." (ibid.: 86) As I would phrase it: they are *immaterial* artefacts in *designed* virtual space.

In his book *The Reconfigured Eye: Visual Truth in the Post-Photographic Era,* William J. Mitchell addressed the next step in terms of Benjamin's description of mechanical image reproduction. Mitchell suggests that if the 'exhibition value' was substituted for 'cult value', then digital imaging substitutes use value, or 'input value' for 'exhibition value' today (Mitchell 1994: 52). Digital technology can thus empower Barthes' notion of a 'reader', who becomes capable not only of interpreting texts, but interacting with them and changing them (Barthes 1977: 142ff).

Replacing Benjamin's term 'reproducibility' with 'the digital replication of cinema', Mitchell speaks of the aura which slowly withers away in a 'shattering of tradition': the process whereby films morph from ritual art objects into "fragments of information that circulate in the high-speed networks now ringing the globe and that can be received, transformed, and recombined like DNA to produce new intellectual structures having their own dynamics and value" (1994: 52). It is, effectively, the reproducibility of the digital object which changes our experience of cinema, as cinema changes from a mass ritual to a form of interactive communication.

In response to Mitchell (1994), Kristen Daly suggests that it is only with the introduction of digital and computer technologies that Benjamin's expectations of cinema have been brought to fruition:

> Novels have long been intertextual and interactive, requiring user-participation and user-interpretation. While film remained ephemeral and inaccessible, subject to a one-time reel-time viewing, it could retain its aura and reduce the mass audience to a single spectator, but as the cinema becomes subject to remix and review and user engagement, it becomes increasingly heterogeneous and hypertextual. (2007)

No copies in the immaterial worlds of today...

Groys suggests that digital images may be referred to as 'strong images', in the sense that no curatorial help seems needed to distribute them across the open fields of communication networks, but only if "they are able to show themselves according to their own nature, depending solely on their own vitality and strength" (2008: 83). Indeed, digital images have a tendency to multiply across the Internet via computers and mobile phones, and digitalization seems to make images independent of any kind of exhibition practice. But Groys argues that a strong image can only be regarded as strong as long as it guarantees its own identity in time. Otherwise, we are dealing with a weak image "that is dependent on a specific space, the specific context of its presentation" (ibid. 84).

Consequently, Groys suggests that it is not the 'image' as such, but the 'image file' which may be called strong. It is also in terms of spatiality that Groys defines the difference between original and copy in the digital world of imagery: "The relationship between the image file and the image that emerges as an effect of the visualization of this image file – as an effect of its decoding by a computer – can be interpreted as a relationship between original and copy." (ibid.: 84). Digitalization has created an illusion, Groys says, that there is no difference between original and copy, that all we have are copies which circulate in the communication networks. But there can be no copies without an original. In Groys'

definition, a digital image is a visible copy of the invisible image file, of the invisible data, in the invisible space behind the image, inside the computer.

Each time we look at a digital image, we are confronted with a new event: the visualization of invisible data. We can say, quoting Groys: "The digital image is a copy – but the event of its visualization is an original event, because the digital copy is a copy that has no visible original. That further means: A digital image, to be seen, should not be merely exhibited, but staged, performed." (2008: 85).

Here Groys introduces the curator as responsible for the visualization and staging. The image and its file may be compared to the musical notation of a piece of music: for music to resound, it has to be performed. Thus Groys argues that digitalization turns the visual arts into a performing art: "But to perform something is to interpret it, to betray it, to distort it. Every performance is an interpretation and every interpretation is a betrayal, a misuse. The situation is especially difficult in the case of the invisible original: If the original is visible it can be compared to a copy – so the copy can be corrected and the feeling of betrayal reduced. But if the original is invisible no such comparison is possible–any visualization remains uncertain." (ibid.: 85)

This is why, according to Groys, the role of the curator is even more powerful than it was before digitalization. And the potential for reformulation of museum practices, it seems, lies in the hands of curators. The curator has become not only the exhibitor, but the performer of the image: a presence designer, in my terminology. A curator does not simply show an image that was originally there but not seen. Rather, the contemporary curator turns the invisible into the visible. By this process, the curator "makes choices that modify the performed image in a substantial way" (ibid.: 85).

Whereas Groys refers to a curator, the description is as applicable to a designer. In the context of this thesis, I suggest that Groys' curator may be referred to as a designer of mediated spaces (the digital image always appears in a real space), or a presence designer, through making the invisible visible:

> The curator does this first of all by selecting the technology that should be used to visualize the image data. The information technology is constantly changing nowadays – hardware, software – simply everything is in flux. Because of this the image is already transformed with every act of visualization using a different, new technology. Today's technology thinks in terms of generations – we speak of computer generations, of generations of photographic and video equipment. But where there are generations, there are also generation conflicts, Oedipal struggles. Anyone who attempts to transfer his or her old texts files or image files using a new software will experience the power of the Oedipus complex over current technology – much data gets destroyed, lost in darkness. (ibid.: 85f)

In his book *Suspensions of Perception*, Jonathan Crary points out that Benjamin foreshadowed the fragmented and circulating art object of today: "Perception for Benjamin was acutely temporal and kinetic; he makes clear how modernity subverts even the possibility of a contemplative beholder. There is never a pure access to a single object; vision is always multiple, adjacent to and overlapping with other objects, desires, and vectors. Even the congealed space of the museum cannot transcend a world where everything is in circulation." (1999: 20)

Fredric Jameson suggested that in cinema, spectatorship can regain a certain aura through digitalisation "… all of this can be said in another way, in which we celebrate the return of Benjaminian aura to the movie screen, where looking retrieves a kind of splendor and authenticity from the perceptual habits of video and television: the "good print" then becomes something like an 'original' again." (1990: 217)

The above is contrasted with a quote from Lev Manovich: "From commanding a dark movie theater, the cinema image, this twentieth-century illusion and therapy machine par excellence, becomes just a small window on a computer screen, one stream among many others coming to us through the network, one file among numerous others on our hard drives." (2001: 211)

In conclusion, there is no such thing as a copy. In the world of digitalized images, we always encounter originals: original presentations of absent invisible digital originals. The process of visualization and exhibition design makes copying reversible; we can now transform what we thought was a copy into an original. Thus, according to Groys, "this original remains partly invisible and non-identical. Now it becomes clear why it makes sense to apply both cures to the image – to digitalize it and to curate it, to exhibit it. This double medicine is a lot more effective than the two cures taken separately; it does not make the image truly strong. Quite the contrary: By applying this double medicine one becomes aware of the zones of the invisibility, of one's own lack of visual control, of the impossibility of stabilizing the identity of the image – of which one is not so much aware if he or she is dealing only with the objects in the exhibition space or the freely circulating digitalized images." (2008: 91)

By consequence, Groys argues that our current curatorial practice can do something that the traditional exhibition could do only metaphorically: exhibit the Invisible. It is through the process of visualization that a reformulation of museum practices may take place. This process also creates the added aesthetic value of bringing the digitalized moving images into the exhibition space: "The aesthetic value of a video installation consists primarily in explicitly thematicizing the potential invisibility of the image, the viewer's lack of control over the duration of his attention paid in the exhibition space, in which previously the illusion of complete visibility prevailed." (ibid.: 89)

PART B. PRESENCE DESIGN AVANT LA LETTRE

INTERACTIVE ARCHITECTURE IN ITS CYBERNETIC SETTING

53. 'Colloquy of Mobiles' by Gordon Pask, installation at ICA London 1968 (photo: Pask 1968). The Colloquy was a development of Pask's 1957 Musicolour machine. The audience interacted with the mobiles through their light signalling arrays. Stephen Gage writes that "in reality, in moderate light levels the public were easily distracted by the moving mobiles and did not try to intercept their signalling 'conversations'. Gage explains this by making a distinction between different kinds of observers: "those that interact and those that observe interaction." (Gage 2007a: 317)

In 1968, at the Institute of Contemporary Art in London, an exhibition called 'Cybernetic Serendipity' took place.[96] It was curated by Jasia Reichardt and featured a 'Cybernetic Sculpture'. It was referred to as an 'electronic environment' that responded to human activity. The sculpture was designed by Wen-Ying Tsai, an engineer who later devoted his career to kinetic sculptures (Reichardt 1969; Tsai 1979).

The same exhibition featured a group of mobiles which interacted with their observers, 'Colloquy of Mobiles', designed by Gordon Pask. A collection of five large, fibreglass robots danced with each other and any member of the public who entered their space (Fernandez 2008; Glanville 2007b). The mobiles were performative systems with a built-in ability to 'get bored'. In the absence of input the system becomes increasingly sensitive. (Pask 1971; cf. Gage 2007a). During repetitive input the system will direct its attention to what is potentially

[96] Several refer to this exhibition as seminal, e.g. Glanville writes: "This exhibition is the stuff of legends: art and cybernetics, artists and cyberneticians, meeting together in a symbiotic feast. It marked both the high point and the beginning of the rapid descent of cybernetics in the arts, for almost from that date cybernetics began to be an almost unusable term, much of its thinking being appropriated by other subjects that had more attraction though, I could argue, less coherence and less honour." (2007b)

new. For Gordon Pask, a performing system must always present a degree of novelty to its observer.[97]

Jack Burnham was the curator behind a similar exhibition at the Jewish Museum in New York two years later. It was titled 'Software: Information technology: Its New Meaning' and displayed hybrid forms of art and design.

Gordon Pask, the English computer engineer, was a key figure in the early development of cybernetics as an interdisciplinary collaboration.[98] His influence on the design of interactive environments – 'cybernetic architecture' or 'intelligent architecture' – can be traced back to his involvement with architects, in London in particular, during the mid 1960s. (Hunt in Ascott 1999: 230; Negroponte 1975: 6f).[99] Several even refer to Pask as an architect.[100] The architect Stephen Gage writes that Pask's performative pieces were designed to entertain: "They had the observer in mind and held the observer in a conversation. It is this aspect of Pask's work that makes him extremely relevant to today's architects.(...) Pask's underlying message is to remind us that Architecture is a time-based art." (2007b)

For Pask, the interactive and communicative dimension of involvement with a computer was essential: "The computer, material and all engages in dialogue and within quite wide limits is able to learn about and adapt to his behaviour" (Pask 1969: 495). Pask presented three criteria which must be fulfilled in performative systems, as well as one optional criterion: (1) It must offer sufficient variety and novelty to intrigue the observer, without being overwhelming; (2) It must include forms that the observer may interpret or learn to interpret at various levels of abstraction; (3) It must provide adequate cues or tacit information to guide this process of learning and abstraction; (d) It may also be designed to respond and engage an observer in conversation, thus adapt its characteristics to a particular mode of discourse (Pask 1971; cf. Gage 2007a).

Pask later devoted his career to developing a theory of learning based on the belief that intelligence is based on interaction between individuals (Pask 1975; cf. Glanville 1997).

The British architect Cedric Price is also regarded as one of the pioneers of cybernetic design as applied to architecture, through his close collaboration with Gordon Pask and John Frazer.[101] Price believed that through implementing new technology in design, buildings would become more responsive to users' needs and would enable users to control the

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[97] Stephen Gage writes that Pask's interactive architecture was grounded in the goal of engaging the observer: "Although 'boredom' is in this case a metaphor, it is likely that Pask was of the opinion that boredom and a need for novelty exist in all classes of observers in a performative system." (2007a: 317)

[98] In the late 1950s, Gordon Pask constructed several electrochemical devices with emergent sensory capabilities: "These control systems possessed the ability to adaptively construct their own sensors, thereby choosing the relationship between their internal states and the world at large. Devices were built that evolved de novo sensitivity to sound or magnetic fields. Pask's devices have far-reaching implications for artificial intelligence, self-constructing devices, theories of observers and epistemically-autonomous agents, theories of functional emergence, machine creativity, and the limits of contemporary machine learning paradigms." (Cariani 1993)

[99] According to Cedric Price, Pask's interest in architecture was triggered by their collaboration on the design of *Fun Palace*: "He wasn't concerned with architecture before, but then he became more of an architect than me, really." (Price et al. 2003: 69). At the time, Pask was working for the Royal Air Force, and built his own computer from a thousand mustard tins to predict how many men the force would require in the year 2000 (ibid.).

[100] See, for example, Cedric Price (2003: 70), Gage (2007a). Cf. Peter Cook who writes: "Architects like to think they are creative and exciting people and that they are concerned with all aspects of the world from which one can then reconstruct the environment. In fact, in the main, they are middlebrow, middle-thinking people who, perhaps, did not have the nerve to be real artists, not the discipline to be real scientists. Pask was therefore a wonderful challenge because he was probably more architect than the rest of us – more able to understand, or at least to parry with the various aspects of culture and phenomena, real, imagined or somewhere out there if you could only grapple with them – that is my interpretation of the business of cybernetics." (Cook 2001) Glanville (2007b) writes: "Pask was an extraordinary and exceptional man who, although he liked to call himself a cybernetician, was active in many fields including drawing, writing lyrics, and the construction of performative art machines, many of which were so radically advanced that it is perhaps not surprising that his work is becoming current so long after he did it."

[101] Gordon Pask and Cedric Price were instrumental in bringing cybernetics to the Architectural Association in the 1960s, where they were a formative influence on a whole generation of students. Pask subsequently taught at the Architectural Association with John Frazer (Gage 2008).

environment.[102] Price considered time as a fourth spatial dimension, in addition to length, width and height. In 1976, the architect John Frazer headed a team of computer consultants assisting Cedric Price in a design proposal for a company retreat facility with spaces for dance, theatre and visiting artists. The client was Gilman Paper Corporation, located in Florida. The proposal, called *The Generator,* was an integrated computer system that allowed rapid changes of arrangement and configuration of a number of design features. A visitor would thus combine "any of 150 of the *Generator's* four-by-four meter, fully serviced, air-conditioned cubes, or walls, screens, gangways, and communications channels into a structure" (Riley 2002: 156). Because Frazer and his colleagues were concerned that the users would not fully recognize the design potential, and to provoke interaction, the *Generator* was programmed to "make suggestions for its own reorganization" (Frazer 1995: 41; cf. Frazer 1998: 130; Hill 2006: 64; Price 2002: 86f). Consequently, the building sometimes reacted to the participants, sometimes it acted independently. As Hill notes, "In addition to the architect and user, in Price and Frazer's proposal there is another animate and creative participant in the formulation of architecture: the building." (Hill 2006: 64)

54. Cedric Price's design 'Generator', 1976. (The Museum of Modern Art, N.Y.)

A much earlier project, The *Fun Palace*, is a noteworthy representative of the cybernetic thinking of the 1960s. The design is attributed to Price, although he and others refer to it as a collaborative effort.[103] The *Fun Palace* was never built, but has nevertheless been influential in the architectural canon, not the least by challenging the myth of the modern architect as a self-sufficient author.[104]

The project began in 1962 as a collaboration between Price and the successful avant-garde theatre producer Joan Littlewood, recognized for her working class agit-prop street theatre since the 1930s. According to Stanley Mathews, Littlewood sought to create a truly Brechtian theatre:

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[102] For a thorough description of Price's work, see e.g. Mathews 2006; Mathews 2007: 142ff. Another architect who was influential in the formation of cybernetic design and architecture is Ranulph Glanville. His continued research applies cybernetics and human learning theory to develop research methodologies concerned with 'research as design'. Glanville and Pask collaborated closely, and Pask was professor at Brunel University, where Glanville acquired a PhD in cybernetics and a PhD in human learning.

[103] Price 2003: 53ff, cf. Stanley Mathews' article 'Cedric Price as Anti-architect' (Mathews 2007: 142).

[104] Cf. Tim Anstey in Rendell et al. 2007: 220ff; Anstey et al. 2007: 24f.

> …not of stages, performers, and audiences, but a theatre of pure performativity, a space of cultural bricolage where people could experience the transcendence and transformation of the theatre not as audience, but as players themselves. Her vision of a dynamic theatrical experience which abolished the invisible 'fourth wall' of conventional theatre, provided the conceptual framework on which Price began to develop an interactive, performative architecture, endlessly adaptable to the varying needs and desires of the users. (2007: 142)

55. Interior of the 'Fun Palace'. The grid design did not allocate a specific entrance. Instead, people could enter from any point. The primary structure of columns allowed for a large, open and unobstructed space in the centre. Pivoting stairs and escalators provided access to the upper levels. The design allowed users to rearrange wall panels to create new spaces from old spaces according to different needs. Cf. pictures in Mathews 2007: 142, 145. (Copyright The Museum of Modern Art, N.Y.)

It was neither possible nor intended to define the *Fun Palace* as a museum, school, library, fun fair or theatre – yet it could serve any of these functions. Although several differences can be noted, the 1976 cultural centre in Paris, the *Centre Pompidou* was modelled on the *Fun Palace* (Mathews 2007: 143).[105]

Mathews describes the *Fun Palace* as a

> …far-sighted venture which utilised nascent computer, cybernetic, and information technologies to create a virtual architecture, capable of temporal transformations, of being reprogrammed and becoming an entirely different building at various times and in different situations. It was to be a socially interactive machine, highly adaptable to the shifting cultural, social, and economic conditions of London in the 1960s. The *Fun Palace* would be a space of possibility rather than direction, a 'text' of empty signifiers, each awaiting 'reading' by an army of 'readers': the individual users. (ibid.)[106]

The above reference to reprogrammable spaces allows us to connect to the theme of mediated spaces – although the examples above do not directly apply to the concept of

[105] Price designed a small-scale version of the Fun Palace: the *Inter-Action Centre*, built in London in 1976 (demolished in 2003). It provided community services and creative outlets for citizens in Kentish Town. Mathews considers the aspect of 'DIY assemblage' more pronounced in this project (2007:143).

[106] Here, Mathews both refers to the broad notion of 'writing' and 'text' which derives from Barthes' seminal text *The Death of the Author,* in which he challenged the definition of the 'author' as a constructed 'product of our society' (Barthes 1977: 142ff); as well as to structural and post-structural linguistic theories. Mathews' article concerns authorship and architecture, and he uses the *Fun Palace* as an example of 'authorship at a remove', where the architect-author takes the role of a 'mediator'. Quoting Barthes' introduction to *The Death of the Author*: "in ethnographic societies the responsibility for a narrative is never assumed by a person but by a mediator, shaman or relator whose 'performance' – the mastery of the narrative code – may possibly be admired but never his 'genius'." (ibid.: 142)

synchronous mediated spaces, it is still useful to note that architects, even then, were concerned with certain similar design issues.

To what extent did the architects involved in cybernetics during the 1960s envisage similar mediated architectural extensions to those discussed in this thesis, enabled through the design of synchronous mediated spaces? Although it is difficult to know, some traces may be found. In a transcribed dialogue from 2000, Cedric Price reflects over his collaboration with Gordon Pask, as he looks through his and Pask's sketches to make a selection for a forthcoming exhibition. In answering Hans Ulrich Obrist's questions about the details of the complicated drawings, the terms 'feedback loops' and 'systems' are frequently used. At one point Price refers to 'electronic billboards' on the original drawings and shows his disappointment that the full potential of these ideas have not been understood – that they have merely been applied in 'electronic commercial advertising'. When Obrist agrees they could have been used more inventively, Price responds in a way that makes us think of synchronous mediated spaces: "You could leave deserts or Ayers Rock as found, and make their virtual reality doubles juggle all around so that people could visit them in five minutes!" (Price et al. 2003: 70)

Issues concerning interactivity were mostly developed outside the mainstream architecture of the 1960s. A special issue of the journal *Architectural Design* in September 1969 featured an essay in which Pask addressed 'The architectural relevance of cybernetics'. Here he claims that architecture and cybernetics share common ground and that architects are "first and foremost system designers who had been forced to take an increasing interest in the organisational system properties of development, communication and control" (Pask 1969). In an article from 2001, John Frazer reflects on the contribution of cybernetics in general – and of Gordon Pask in particular – to architecture, with reference to the small cybernetic milieu which slowly formed at the Architectural Association (AA) in London (later in Hong Kong, where Frazer subsequently taught):

> Avantgarde architectural thinking in the 1960s was occupied with issues of flexibility, impermanence, fabrication, computers, robotics, and a global approach to energy, resources and culture. The implied systems thinking in architecture inevitably came to embrace Gordon Pask. Gordon found the AA to be a sympathetic environment, the AA warmed to Gordon and the fertile relationship extended for the next 30 years. (Frazer 2001: 642)

Frazer's own continued application of cybernetics to architecture involves the use of computers to generate the design of natural and artificial processes. Frazer and his colleagues have not specifically exploited the potential of communications networks to establish synchronous mediated spaces, but there are some links which indicate an awareness of distributed spatial design. This is worth noting, since I am trying to explain why, in architecture, the path towards interactive architecture has not been taken.

A 1995 exhibition in London featured *The Interactivator*, a model for an evolving environment designed to respond to interaction with visitors. Different sensors in the exhibition space would also influence the evolution of the model. By using the Internet, the installation also reacted to the input from virtual visitors, who would provide 'genetic information' to the model. The program of the model could also be downloaded to remote sites "so that it replicated itself and each replication took on a divergent evolutionary path, the results of which could also be fed back to the central model to contribute to the gene pool" (Frazer 2001: 646). Via the Internet, it was also possible for remote visitors to follow the evolution of the model.

In Chapter 8, I discuss the distinction between architecture as representation and architecture as generative design, where some of this discussion is repeated. In effect, what I will argue is that the future of architecture as a discipline lies along a path which in many ways was drafted in the early 1960s, and for different reasons abandoned. A *re*-cognition of these early attempts, a *re*-contextualization of concepts used in adjacent visual practices, and a *re*-newed collaboration between architects and engineers may change the course of architecture once again.

The examples above illustrate the influence of cybernetics on a systems-oriented architecture, which adapts to changing needs and social functions. Architects in the 1960s were clearly concerned with the interrelation of technology and architecture, in a way which predates our current concern. Can we say their attempts were, in some respect, similar to attempts being made today? Were they waiting for technological developments before they addressed synchronous and distributed spaces? Could these same architects have dealt with presence design?

To illustrate that the tools for presence design were already available in the 1960s – and to further explore whether architects were concerned with similar issues – we need to look at some other developments which emerged in parallel to the ones already discussed. Could architects in the 1960s have been concerned with the same spatial issues as we are? Could they have been designing synchronous mediated spaces? Were they? To follow this thread, we will approach an interdisciplinary academic setting on the North American east coast.

Second-order cybernetics in relation to architecture and design

In the above, I have stressed the involvement of architects in the formative years of cybernetics. If and how cybernetics has henceforth impacted on architecture is another question to pursue. The architect Stephen Gage, Professor of Innovative Technology at the Bartlett School of Architecture, of the University College of London and founder of the Bartlett Interactive Workshop, writes: "It is curious that this relationship has not generated in architecture an easily identified stream of output in the form of 'cybernetic' buildings or artefacts." He continues: "Instead we find a much more diffuse collection of influenced work which ranges from urban planning through buildings, installations and into conceptual drawing and painting. I put this down to the wide-ranging nature of cybernetic theory and the wide-ranging nature of architectural practice." (Gage 2007b)

Stephen Gage worked with Pask both as a student and later as a practitioner and teacher (Glanville 2007a: 1201). Writing in 2007 and with reference to the 1968 conversation theory, where Pask put forward the idea that architecture might respond to and engage an observer in a conversation, Stephen Gage reflects that "[t]his is a challenge that remains to be met. We have not gone much beyond Pask's *Musicolour* machine and his *Colloquy of Mobiles* (installed at the ICA in 1968) in the last forty years" (Gage 2007b).

In recent years, several architecture schools have applied cybernetic thinking to design, and many artists, designers and architects work in the wake of Pask (see e.g. Frazer 1995; Haque 2007; Cariani 2003, 1993; Miranda 2006).[107] Perhaps due to the increased availability of computers, the generative design strategies of the 1960s have thus been re-contextualized and considered seminal for many current media, art and design practices, for which traditional disciplinary distinctions between 'architecture', 'design' and 'media' matter less and less (Hughes 2009; Hughes 2007: 132ff).

A cybernetic approach to architecture has been pursued by small groups in the US and UK, and as noted by Peg Rawes (2007), this may be perceived as an unbroken path rooted in the developments of the 1960s. Second-order cybernetics has been compared with recent

[107] Aside from initiatives at the Bartlett and Architectural Association in London previously mentioned, recent attempts to replicate Gordon Pask's electrochemical experiments include the 'Maverick Machines' exhibition, Mathew School of Architecture, Edinburgh University in 2007 (reviewed in Glanville 2007b), as well as 'Pask Present', an exhibition of experimental and contemporary art and design growing out of Gordon Pask's cybernetic theory and practice, Vienna 2008, where e.g. architect Omar Khan displayed *Open Columns Homeostat,* a small-scale model of a responsive architectural system. Columns slowly move down into inhabited space reacting to C02 produced by groups of people causing them to disperse. As CO2 reduces, columns slowly lift, enabling people to once again gather - resulting in a dynamic and responsive space ('Pask Present' 2008). Kahn is co-director of the Center for Virtual Architecture at the University in Buffalo, and pursues research regarding responsiveness and performativity in architecture. Of similar interest, the project *Dune 4.0* by Daan Roosegarde was displayed at the Netherlands Media Art Institute 2007 (reviewed by Lucy Bullivant 2007); and the project *Dendroid* by architect Pablo Miranda (reviewed in Hughes 2007: 137ff) as well as the work within the 'Krets' group (Marcelyn Gow, Ulrika Karlsson, Pablo Miranda, Daniel Norell, Jonas Runberger, see www.krets.org) at the School of Architecture, Royal Institute of Technology, Stockholm.

post-structuralist practices, for which the concept of architecture is constructed out of the contingent relations between human agents, social processes, interaction, modes of representation, materials, technologies and the built artefact.[108]

The term 'second-order cybernetics' is attributed to Heinz von Foerster, following a contribution from the anthropologist Margaret Mead in 1968, who put forward that cybernetic principles should be applied to cyberneticians (as scientific observers) themselves. Defined as the practice of including the scientific observer in the observed, second-order cybernetics is characterized by the concept of 'the observing observer' which actively involves the (scientific) observer in a cybernetic system (Mead 1968; von Foerster 1974). As explained by von Foerster, the function of the scientific observer – in first-order cybernetics – was rather extrinsic to the underlying laws of organization. The shift from first- to second-order cybernetics is thus marked by the fact that the scientific observer is intrinsic to the principles of cybernetic organization; the observer is self-aware or 'self-reflexive' – an 'observing observer' (von Foerster 2001: 288f). Second-order cybernetics thus includes the embodied and qualitative relationships between a human subject and the surrounding world.

Calling on von Foerster's concept of the 'observing observer', Peg Rawes applies second-order cybernetics to architectural design, arguing that this correspondence exists when the "processes and constituents for constructing space are distinct, yet connected, self-referential 'realities'" (2007: 1487). She proposes three similarities which characterize both practices: (1) the *act of constructing* its respective architectural or cybernetic realities; (2) the relationships that compose *different* architectural or cybernetic spaces; and (3) the *necessity* (that is, an *ethical* requirement) that each architectural or cybernetic reality also exists simultaneously in different modes of physical and psychic materialization.

Rawes suggests that when combined, the two approaches "enable unique forms of spatial representation and modes of interaction to be simultaneously generated, including: spatial designs and ideas, geometric subjects and figures, embodied observers or subjects." (2007: 1487) She compares the concern within cybernetics to generate dynamic relationships between its constituents (interactions between observer and subject, and his or her act of constructing a reality), with the concern in architectural design for creating dynamic spatial relationships. The latter is especially noticeable within the initial stages of a design process, during the processes of drawing and modelling, when each designer may represent "a self-organizing and self-reflexive agent that enables new versions of the original ideas to be materialized or re-presented as drawings, designs or text, each of which is part of an iterative design process" (2007: 1490). According to Rawes, the self-organising processes of manufacture and identity within architecture are expressed in the multiple ways through which the designer and user operate, for example, "the different verbal, visual, textual modes of communication, together with the use of technologies through which architectural design ideas and theories are transmitted and materialized" (ibid.). In conclusion, Rawes states that a post-structuralist architectural design project conforms to second-order cybernetics "because of the relations between the various constituent human, technological and material modes of representation – i.e. the ideas and context of production including materials and actions of the individual participants. Geometric architectural space is therefore constructed by an irreducible combination of physical, aesthetic, material, social and cybernetic conditions."(ibid.)

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[108] As Peg Rawes notes, the development of second-order cybernetics occurs in parallel with French post-structuralist philosophers such as Gilles Deleuze, Jacques Derrida, and Luce Irigaray, all of whom stress the need to observe multiple subjectivities. In post-structuralist practices, as illustrated by the architectural writing and research of Cedric Price, Mark Wigley, Catherine Ingraham, Neil Spiller, Jane Rendell, Beatrice Colomina, and Stan Allen, amongst others, architecture is understood as a relationship between human agents and different social processes of interaction and exchange, modes of representation, materials, technologies and the built product. A self-reflexivity and self-referentiality is generated by the multiple physical, material and psychic modes of interaction that designers, building professionals and users all contribute.

SHARING SPACES: THE FIRST MEDIA SPACES

In 1968, Nicholas Negroponte, a graduate in computer-aided design at the Massachusetts Institute of Technology (MIT) in Cambridge, USA headed the Architecture Machine Group, a new research group which later developed into the MIT Media Laboratory.[109] In 1970, the group exhibited the project *Seek*, a computer-supported space for a colony of gerbils where 480 small cubes moved in response to the gerbils' desires (Negroponte 1970; 1975; Benthall 1972). It is important to note that this was a prototype in real space, not a design proposal on paper.

56. The Project 'Seek' by the Architecture Machine Group of the MIT Media Lab, 1970. Negroponte is seen standing behind the installation. (Architecture Machine Group, 1970)

Around the same time as the MIT Media Lab was formed, in the early 1960s, another laboratory with similar interests was established, this one on the American west coast. Douglas Engelbart, an electrical engineer employed at the Stanford Research Institute (SRI), founded the Augmentation Research Center, a laboratory dedicated to how computers could be used to augment human intelligence, with funding from the United States Defense Advanced Research Projects Agency (ARPA) (Gere 2002: 66).[110] Amongst several significant advances in computer display technology, Engelbart designed an 'experimental pointing device' between 1963 and 1964, the precursor of the computer mouse (Engelbart & English 1968; cf. Gere 2002: 66f).

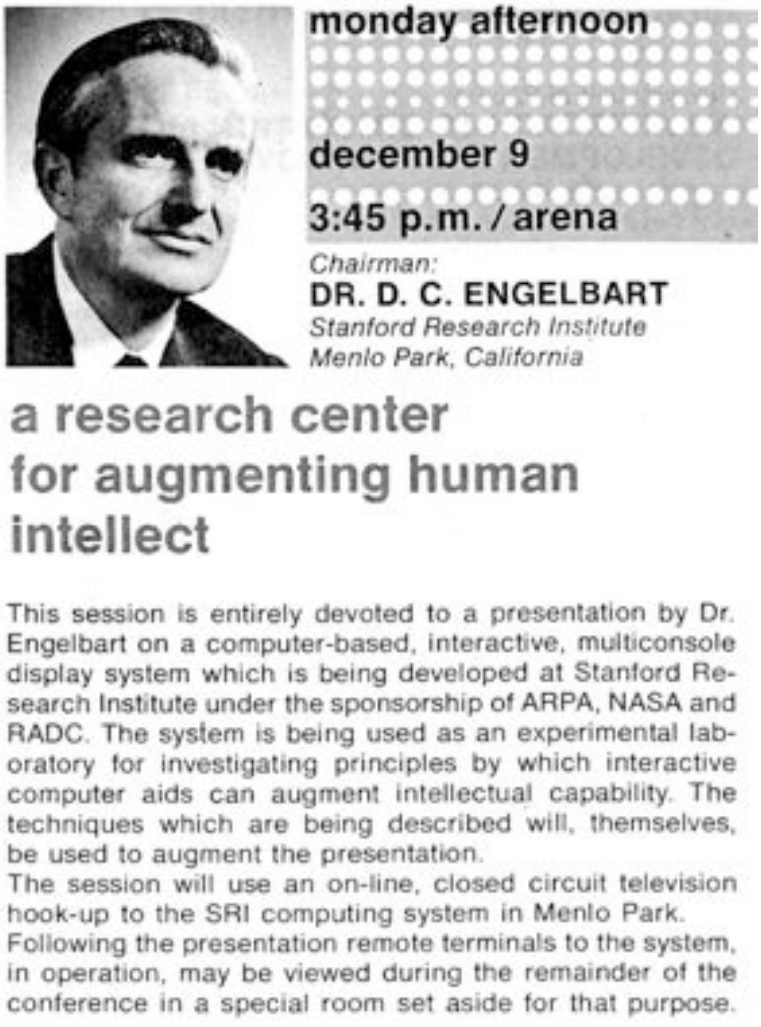
On December 9, 1968, at the Fall Joint Computer Conference in San Francisco, California, Engelbart and his colleagues at the Stanford Research Institute performed a well known 'multimedia presentation'. This is often referred to as the *NLS Demo*, and constitutes a 90-minute video-mediated presentation of the online system, *NLS*, the SRI team had been working on for six years, with the aim of 'augmenting the human intellect'. The occasion was

[109] According to Charlie Gere, Negroponte joined the faculty at MIT in 1966 and the Architecture Machine Group was founded in 1968, intended as a combined laboratory and think-tank to study the human-computer interface. Between 1979 and 1980, together with the former MIT President Jerome Weisner, Negroponte put together a proposal for the MIT Media Lab as a successor of the Architecture Machine Group, intending to bring together into one lab the diverse strengths found at MIT, including computer programmers, but also psychologists, film-makers, musicians, designers, anthropologists, designers, etc. (Gere 2002: 128).

[110] The needs of the US Department of Defense, at least to some extent, appear to have influenced the direction of research both at Stanford, Xerox PARC, and MIT. Robert Taylor, who would head Xerox PARC's Computer Science Lab 1970-83, had previously been responsible for exploring new areas of technology at NASA, and channelled funding to SRI while employed at ARPA (Poole 2005: 227). In an interview from 2003, Engelbart says, "What saved my program from extinction then was the arrival of an out-of-the-blue support offer from Bob Taylor" (ibid.). Gere writes that in 1976, Negroponte and The Architecture Machine Group at MIT proposed a project to ARPA called 'Augmentation of Human Resources in Command and Control through Multiple Media Man-Machine Interaction' (Gere 2002: 128).

not only the first public viewing of the computer mouse, but also demonstrated the use of other innovations, such as hypertext and remote collaboration via live audio and video link. Researchers at the Stanford Research Institute offices in Menlo Park participated remotely to the conference, visible to the conference audience, as the use of a shared computer display was demonstrated. The remote colleague could not see the audience, but a two–way audio link permitted conversation between the two locations.

57. Images form the NLS demonstration of real-time video in 1968, where Doug Engelbart presented the work achieved at Stanford Research Institute. Later, research colleague Jeff Rulifson is introduced, who participates remotely from an office in Menlo Park. (Engelbart 1968)



58. Advertisement for the event.

The importance of Stanford University being physically located in the heart of the Silicon Valley, just south of San Francisco, must be noted. From the 1950s onwards, this area became the epicentre of the microelectronics industry, and it was here that Xerox decided to

establish its research centre: Xerox Palo Alto Research Center (Xerox PARC) in 1970.[111] In the following, I will look more closely at its influential Computer Science Lab, headed by Robert Taylor and involving Douglas Engelbart.

Xerox founded Xerox PARC to explore 'the architecture of information', and its Computer Science Lab may be credited with many of the applications and information technology currently used.[112]

Media Space was the name given to the first research project on electronically shared work spaces at Xerox PARC, and several of those initially involved in the project were architects, for example Bob Stults, Ranjit Makkuni and Steve Harrison. Steve Harrison has recounted that the influence of their professional identity had an impact on three levels: (1) a concern with the creation of place from space; (2) their understanding of the users as the "legitimate creators of their own places"; and (3) that, as architects, they were accustomed to working in "large shared drafting rooms and wanted to use that as the model for collaborative workspaces" (Harrison in Erickson & Mc Donald 2008: 155). Thus, *Media Space* was at least partly modelled on the architects' workplace and architects' collaborative drafting. A primary aim of *Media Space* was thus to support collaboration, or as summarized by the creators, an ambition to support 'the social practice of design' (Harrison 2009; Stults 1986; Bly et al. 1993).

59. The original 'Media Space' work environment at Xerox PARC. (from Bly et al. 1993; Baecker et al. 2008)

In comparison to more recent attempts to design interiors in which audiovisual communication technology is integrated, the original media space workplace appears quite basic and rudimentary. From the documentation, however, it is clear that several of those who were involved were interested in the relationship of technology and spatial design in the context of collaboration and interaction. Harrison's focus on the social aspects of computer-

[111] For a detailed description of this development, see e.g. Gere 2002: 115ff.

[112] According to legend, the Xerox CEO expressed a vision of 'the architecture of information' in 1969, and immediately turned to the vice president of research and development saying, "All right, go start a lab that will find out what I just meant." (Poole 2005: 229) Under Robert Taylor's leadership of the Computer Science Lab, between 1970 and1983 (one of three labs at Xerox PARC), major advances in computing were made, including the first personal computer, but also others that form the basis for several computing companies, such as Adobe and Apple (Poole 2005: 29). The Xerox brand, however, failed to be included in the vision (Dourish 2004: 28). Previously employed at ARPA, Taylor was responsible for the development of ARPANET, a communications network regarded as the precursor of the internet, a work which also involved Engelbart (Poole 2005: 228).

supported workspaces is confirmed in a recent book where he reflects on '20+ Years of Mediated Life', i.e. the time that has elapsed since the first *Media Space* was realized (Harrison 2009). This reflective approach is also noticeable in his contribution to a 2008 conference in which he said:

> The original definitions focused on the technology. But they were only partial 20 years ago because they could not fully account for interaction between the separate paradigms that informed media space design and analysis: spatial, social, and communicative. The media melds with the space, altering the sense of space and place. While media spaces were intended to provide continuity for sociality for physically separated members, it also greatly distorted the social conventions of physical space: people would overhear without being seen, for example. And the usual measures of information flow seemed inadequate to explain the interplay of social cueing that media spaces provided, leading to research on shared drawing and awareness. With the lens of wireless IT, we see that multiple paradigms and multiple definitions are necessary to make any sense of mediated life. (Harrison in Baecker et al. 2008)

Steve Harrison has commented how the work of artists Kit Galloway and Sherri Rabinowitz inspired him as he joined Xerox PARC and the *Media Space* project team.[113] In 1980, artists Kit Galloway and Sherry Rabinowitz performed a seminal *Hole in Space* installation, a *Public Communication Sculpture*, across the American continent, between the Lincoln Centre for the Performing Arts in New York City and The Broadway Department Store in Century City, Los Angeles (Hole in Space). The social dimension of Galloway's and Rabinowitz' installation has also inspired other followers in the genre of electronic cafés (Wilson 2002).

60. The 'Hole in Space' installation by artists Galloway and Rabonowitz in 1980 (photos: Galloway & Rabinowitz 1980). At each site, life-sized images of passers-by were projected: "More similar to window shopping than a sidewalk encounter with friends, people would stop, stare for a while, hear the sound of the remote conversation, and then strike up a conversation with passersby at the other end." (Bly et al. 1993)

'Media Space' research – the formative years

The ambitions behind the original *Media Space* design is revealed in the documentation of the researchers. They describe it as follows:

> An electronic setting in which groups of people can work together, even if they are not resident in the same place or present at the same time. In a media space, people can create real-time visual and acoustic environments that span physically separate areas. They can also control the recording, accessing and replaying of images and sounds from those environments. (Stults 1986; cf. Bly et al. 1993)

[113] Harrison joined Xerox PARC in 1985 and has described that, at the time, he came across the work of Galloway and Rabinowitz which dramatically changed his way of thinking about video-mediated communication (Harrison in Erickson & Mc Donald 2008: 155).

To understand how and to which extent the project's social and technical ambitions were embedded within spatial design, let us observe the original setting in some detail. As it developed between 1985-88, the concept of *Media Space* emerged from the need to support collaboration between researchers at the Xerox PARC System Concepts Laboratory (SCL). In 1984, this research unit was geographically divided between two offices in different locations: Palo Alto, California and Portland, Oregon.

Sara Bly, Steve Harrison and Susan Irwin, who were active researchers at the lab, have stressed that social and technological communications were both a component of research and lab discourse: "The social orientation was an acknowledged part of SLC's agenda and way of working." (Bly et al. 1993) The lab's mission was to "consider interpersonal computing, the logical successor to personal computing which had dominated computing and communications research at PARC for several previous years" (Bly et al. 1993). Computing was interpreted as a means to support social communication between staff: "Lab members saw it as a challenge to integrate access to large shared information sources and powerful computational services together with activities such as casual interrupting, gossiping, and brain-storming." (ibid.) The researchers formed a close workgroup and were accustomed to collaborating informally on projects and management alike. Weekly meetings ensured a frequent exchange of research progress as well as social activity.

A turning point for the group came in 1983, when they realized that "high-bandwidth communications allowed them to talk about audio, video, and computing together" (ibid.). The initial link enabled a transmission capacity of 9.6 kilobits per second between the two sites and was soon replaced by a 56 Kbps link (ibid.).

Bly et al. stress that the concept of *Media Space* emerged slowly from the informal collaboration between researchers in two different groups. It was never an outcome of a carefully structured design process: "Rather, it grew out of the Design Methodology group to support design as a social activity and evolved to become the research focus of the Collaborative Systems group." (ibid.) The main task of the Design Methodology group was to design tools, primarily video tools, to enable teams to record the development of their projects: "One of the earliest uses of video in the group was a fixed, real-time, local area video/audio connection between three researchers' offices." (ibid.)

61. Photo of the 'Media Space' environment at Xerox PARC. A real-time connection provided a link between three researchers' office cells, all nearby. (Photo: Bly et al. 1993)

In turn, the focus of the Collaborative Systems group was computer-based information and process management for collaborative work groups; they sought to develop "tools that would support an existing cross-site development project within the Laboratory" (ibid.). Thus, for lab meetings distributed between Palo Alto and Portland in 1985 "[a] camera, monitor and speaker phone were positioned in the common area, the share area surrounded by offices. The link consisted of video compression equipment, a 56 Kb per sec data line, an audio teleconferencing system, a standard phone line, and consumer quality video cameras and monitors."

The researchers describe that soon, the connection was left open throughout the work day: "Thus, walking through the Commons provided an opportunity to see, hear, and speak with anyone in either Commons area." While it was initially intended as a cross-site meeting tool, the researchers reflect that its primary use was for 'chance encounters' between researchers at the two sites. Because the equipment was easy to move around, researchers who met by chance could bring the equipment into their office cells and continue a private conversation. Once the 'Commons-to-Commons' audio/video link was established, the Collaborative Systems group included it in their research on how to support teamwork. Bly et al. write that one project team held cross-site meetings and focused on participation issues, while another team worked on how technology could "provide a surrogate for physical presence". One proposal was a remote-controlled robot, with an integrated camera and monitor, which would "wander the hallways of the remote location, not only providing the 'seeing' aspects of remote presence, but by displaying a video image of the person driving it, it would provide the 'showing' part as well" (ibid.).

The office design in the two locations was similar: "The site in Portland was designed with a physical environment that closely matched the one in Palo Alto. Offices were on the periphery of a common area with a private conference room nearby." (ibid.)

One of the first prototypes included four office spaces where a video-switch allowed researchers to access one another. Soon, this four-office 'media space' was extended and included the shared work areas of the labs as well as the informal space of the two common rooms, already connected by a fixed link:

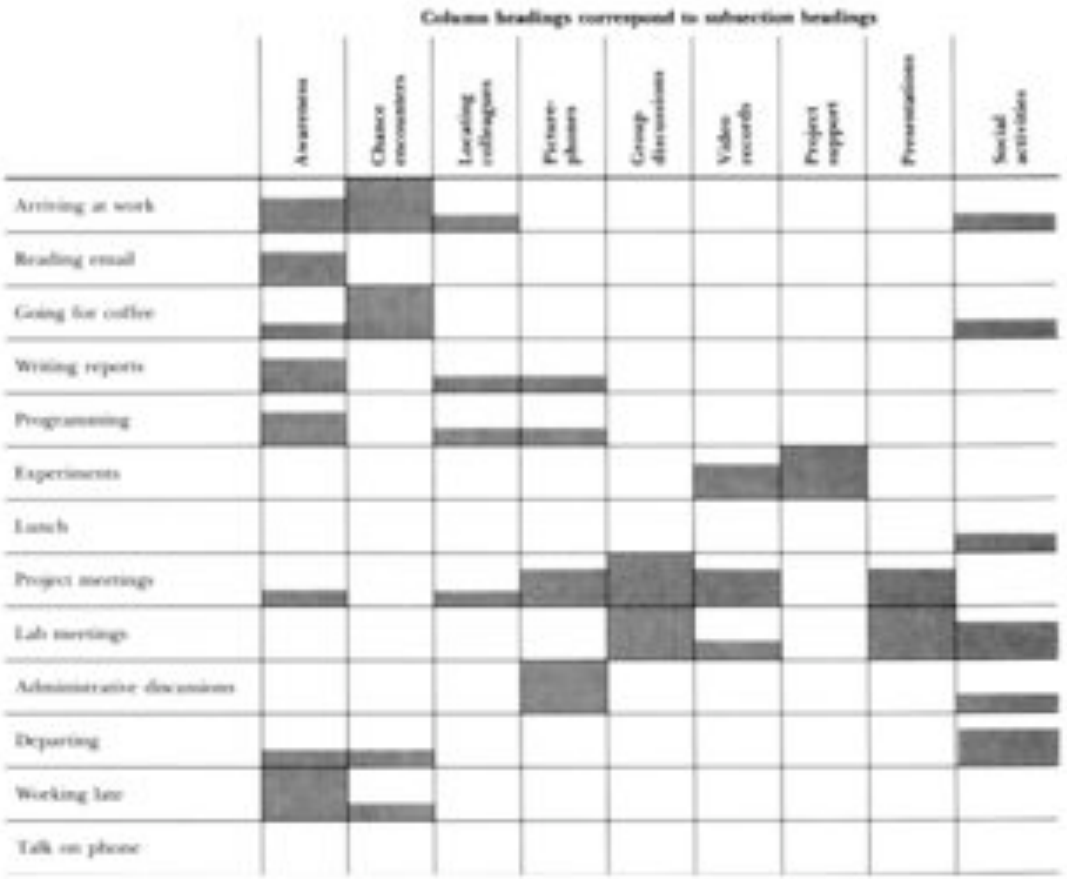
> Public-to-private connections were now added to the existing project-centric, peer-to-peer, office-to-office connections (...) [l]ab members could move fluidly from using the public video/audio connection in the Commons to a more private use of media space in their individual offices. The media space could exist or not exist in a variety of places; the media space could be or not be a major focus in these locations. (ibid.)

It is important to note that researchers always made an active choice as to whether or not they would like to engage in mediated interaction. The first technical report about *Media Space*, compiled by another of the participating researchers, includes the following description by Bob Stults:

> We changed connection by walking to the switch and pushing the buttons on its panel. We changed connection sometimes for reasons, sometimes for whim, never according to a schedule. We made changes many times a day, and we rarely went even for half a day without changes. We typically created a connection, lived with it for several hours, and then replaced it with another. Thus we moved irregularly through all the dyadic relationships in the group. We dealt with privacy directly, mostly by turning off the microphone in the office, perhaps once or twice turning off the camera. Conversely we dealt with disturbance just as directly, controlling the volume on the TV monitor. (Stults 1986; cf. Bly et al. 1993)

The distributed *Media Space* prototype expanded and several longer research projects were initiated (e.g. Olson & Bly 1991; Irwin 1991; Abel 1989). These practice-based research projects involved the researchers themselves and addressed organizational issues, interpersonal dynamics, as well as other technical issues and interaction design issues, such as the following: how to enable access to media space (e.g. via remote camera control, meeting protocols, interfaces); shared applications (e.g. drawing tools, shared access to a database);

the impact of new communications on existing social relations; privacy issues; and the design of work environments. The researchers documented their experiences in internal reports and various other ways, and used videotape footage in their analysis. Summarizing these experiences, Bly et al. (1993) illustrate different functions and daily activities supported by the *Media Space* in the table below:



62. Table reflecting how 'Media Space' was used by individuals throughout a typical workday at SLC. The thicker the box, the more significant the use. (Bly et al. 1993: 38, Table 1)

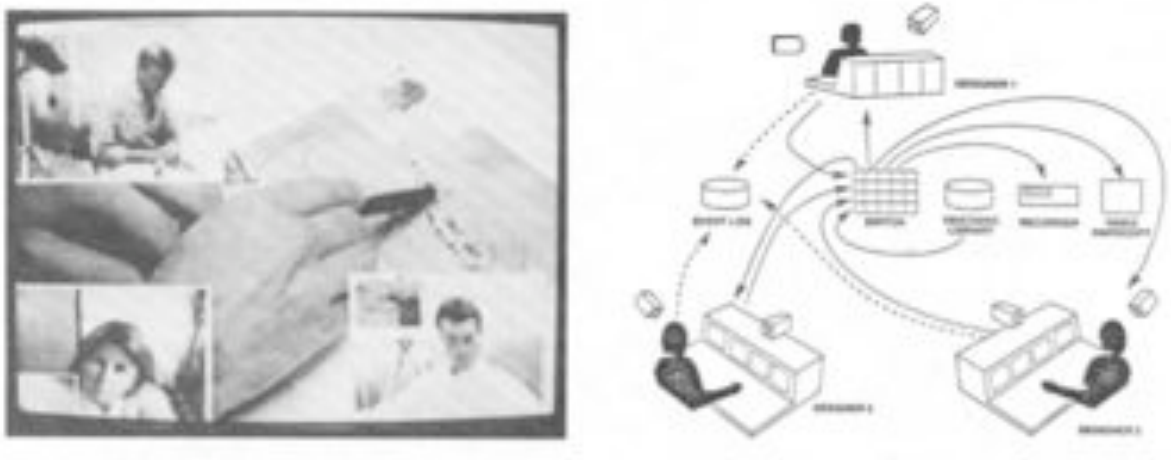
What is significant about the first *Media Space* prototypes is that displays and cameras were arranged in connection to the work desks but also integrated into the informal social spaces of the office environment. The first prototypes, along with different tools needed for distributed collaboration, were continuously adapted and documented until the beginning of the 1990s. Sara Bly, Steve Harrison, Susan Irwin, as well as other researchers who were active at the lab, noted the benefit of supporting informal interaction between workplaces and how participants in each location adapted their behaviour to the hybrid environment (Bly et al. 1993; Mackay 1999). One researcher, Victoria Bellotti, who participated in the Palo Alto-Portland media space, rearranged her office in order for her remote colleague to have a better view of her and the commons area; to support 'better mutual orientation'. As noted by Sawhney (2000), "there is a gradual exchange of mutual ownership in media spaces that influences social protocol and physical layout of the connected spaces."

Informal social protocols were often developed to deal with issues of intrusion, privacy and other awkward situations that the users may experience (Bly et al. 1993). The researchers themselves testify that their relationships and work habits changed accordingly, and proposals of how to tackle privacy issues were put forward (ibid.). Insights from early 'media spaces' also concerned the concept of 'awareness' and the distinction between social,

peripheral awareness and more direct face-to-face awareness. Although a shared live connection more frequently was used for direct face-to-face interaction, it could also provide a peripheral awareness. Subsequent research has therefore focused on how to support shared awareness and the building of a sense of community across time and space. These studies have noted the benefit of asynchronous updates in comparison with live real-time connections (e.g. *Portholes*, see Dourish & Bly 1993; the *Clearboard system*, see Ishii & Kobayashi 1992; and *Awareness Spaces*, see Sawhney 2000). As noted by Nitin Sawhney, "There is a tradeoff between observing continuously updated cues, which can be considered distracting vs. messages transmitted infrequently requiring a user to re-establish context and perhaps miss important cues." (2000) According to Sawhney's findings, "intermittent cues perceived over a continuous time-span, such as a flurry of SMS messages on mobile-phones between 2 or more parties over a 3-5 minute duration" will provide a similar sense as that of being in a media space, an observation that leads him to coin the term 'awareness space' (ibid.).

Amongst the different social issues in relation to social interaction which were noted in early 'media space' applications, the need for eye contact is one which has led to continued research (see section on mutual gaze). Christian Heath and Paul Luff (1991) noted that in long-term use, the sense of mutual gaze (then comparatively poor) impacted communication gestures, and that the location of cameras outside the display made mutual gaze impossible.

PARC researchers also tested *Media Space* outside the Xerox collaboration. In 1987, an office design project brought together three architects who had never met, but collaborated in a video-mediated workplace over two days and produced a design together. Steve Harrison and Scott Minneman, who carried out this case study, reported positive results in terms of collaboration and that "the designers expressed some preference for electronically mediated communications over face-to-face relations since it permitted them to draw together from the privacy and convenience of their own drafting table and to be visible and active in the group while working privately" (Harrison & Minneman 1993: 788; cf. Harrison et al. 1990; Weber & Minneman 1988). Their report stresses that this study specifically focused the need for improved design tools to enhance communication between designers: "We believe that design is a social activity – the interactions of individuals within groups and the relation of groups to one another. Another way we express this point of view is to say design is the social construction of a technical reality." (Harrison & Minneman 1993: 785) Their definition of 'media space' also has a clear design focus: "Media Spaces are made of audio, video, and computing systems that connect designers across time and space." (ibid.)



63. A 'media space' for three architects in different locations. The caption reads: "three architects work together in three separate locations, meeting only through real-time video. The 'Media Space' also provides a shared library of video scenes, a log of events to aid in retrieving recordings, and hard copy images. The recordings of the work are both a journal that they use in their design work and one that we use in our design research." (Harrison et al. 1990; cf. Harrison & Minneman 1993: 788)

64. Design Communications workshop. (Harrison et al. 1990: 89)

These and similar projects later led Xerox PARC to develop video tools such as shared sketchpads and whiteboards. In their summary of three years of research focused on the Portland-Palo Alto *Media Space*, Bly et al. (1993: 40f) reach the following major four findings, of which several have been pursued in further research: (1) Technologies can support social activities of work groups distributed across space. They note: "The frequent and regular use of the media space for awareness, for informal interactions, and for sharing culture are all indications that technologies are supporting more than task-specific communication." (2) A work group can collaborate across space as a single entity: "People regularly referred to all members as 'we'. (...) People within the group depended on others, regardless of location, as resources in work and play." (3) Design considerations for a media space were identified: "Factors affecting the shape of a media space include group size, the working relationships within the group, the physical proximity of members of the group to one another, the nature of the work, and the group's approach to work and social relationships." Their fourth conclusion (4) is that design through an interweaving of technology and work activity is viable. This is illustrated by functions identified through media space research, which through continued research and product development has resulted in numerous products, such as shared drawing surfaces (ibid.).

In comparing *Media Space* to video conferencing technologies, they reflect that video conferencing is problematic because it is a static, fixed installation in a space that people have to enter in order to use. *Media Space*, in contrast, was adapted to the needs of the individuals: "Most video conferencing requires that one 'go' someplace; it is not an integrated pat of the office itself. The videophone model lacks the ability to maintain a peripheral awareness of activities in the space or to take advantage of spontaneous interactions: 'calling' requires a deliberate action and implies a beginning and an end." (Bly et al 1993: 42)

In their reflections and proposals regarding future research it is also interesting to note that several of their early developments have come to fruition, such as the widespread use of the software *Skype*. They note: "Desktop video, however, has potential for offering the same capabilities as a media space does, especially if the camera is not integrated into the workstation and is freely movable." (ibid.)

The Portland lab was closed in 1988 and SCL then merged with another lab to form the System Sciences Laboratory (SSL) in Palo Alto. Research continued to address design processes, collaborative systems and work practices.

In the beginning of the 1990s, under Marc Weiser's leadership, the Xerox PARC lab developed a wide-ranging research program around the vision of 'ubiquitous computing', where computers would not be seen but computation would be everywhere (Weiser 1991; cf. Dourish 2004: 29f). Weiser fostered this development of computational technologies, infrastructure and new application models in three areas: (1) 'Computation by the inch', focused on the development of small devices, such as electronic tags, badges or 'Post-it'

notes; (2) 'Computation by the foot', concerned with computationally enhanced pads of paper; and (3) Computation by the yard (Dourish 2004: 30ff).

A European Xerox lab was also set up in Cambridge, UK, called Rank Xerox EuroPARC. This was a smaller outfit where 20-30 researchers worked together in a combination of real space and media space as part of the *RAVE-project*, or *Ravenscroft Audio/Visual Environment* (see Buxton & Moran 1990; Gaver et al. 1992).

A more articulate focus on interdisciplinary research into human-computer interaction and computer-supported work was formed in this context (Dourish 2004: 33). Inspired both by previous experiences of *Media Space* and the vision of 'ubiquitous computing' – computing integrated in the physical environment – a number of projects were carried out, such as the *Digital Desk* (Wellner 1993) and the *Reactive Room* (Cooperstock et al. 1997). Built in 1992-93, the *Reactive Room* was a mediated meeting room in which participants could participate in person as well as remotely and where both synchronous and asynchronous communication was supported. Ubiquitous computing enabled the room to respond to the user context. Paul Dourish writes:

> By using an active badge or similar system, the room's control software can be informed of who is in the room and can configure itself appropriately to them. Similarly, if the room 'knows' that there is a meeting in progress, then it can take that information into account to generate an appropriate configuration. If a user pressed the 'meeting record' button on a VCR, to record a meeting in progress, the Reactive Room can determine whether or not there are any remote participants to the audio/video nodes and, if so, ensure that it adds those signals to the recording. When someone in the room makes use of the document camera or the projected computer display, the room software can detect these activities and automatically make the document camera view or the computer display available to those people attending the presentation, either locally or remotely. (Dourish 2004: 39)

Via a network, all EuroPARC staff had access to the *Reactive Room* via audio/video 'RAVE nodes'. (Bly et al. 1993: 42)

Media space followers

A number of similar design projects carried out in the late 1980s and beginning of the 1990s are worth mentioning. Negroponte's 1995 collection of essays, *Being Digital,* sketched how immaterial services and Internet technologies would transform society. In parallel, the work of Hiroshi Ishii and Brygg Ulmer took a similar direction in a research program at the MIT Media Lab, focusing on 'tangible bits' and ubiquitous computing. Aiming to provide seamless interfaces between "people, bits and atoms," they broadened the field of mediated space design to include spatial elements such as an integrated design of desks, boards and rooms. Three examples from the Tangible Bits group worth mentioning in this context are the *metaDESK* (Ullmer and Ishii 1997), the *ambientROOM* (Ishii et al. 1998) and the *Clearboard System* (Ishii & Kobayashi 1992), a series of 'transparent' drawing boards used for remote design collaboration, which allowed you to see and collaborate with your colleague, who appeared as a projection on a double-sided drawing surface. The *ambientROOM* was a small office cell, augmented with different ambient displays, designed to provide background information to the user, such as light patterns, audio and design features that responded to changes in the air flow, the presence and activity of new users, the arrival of email, or users logging in or out. "For instance, light patterns projected on the wall can respond to the activities of a networked computer system, conveying information about network traffic and hence activity in the virtual space; or movements in a shared project room can be mapped onto subtle sounds in the Ambient Room so that the occupant can be aware of comings and goings in the project space." (Dourish 2004: 47)

Other projects similar to the Palo Alto-Portland *Media Space* can be noted, for example, those carried out within the TeleCollaboration: US West Advanced Technologies project. This research group was divided between two locations: Denver and Boulder, Colorado (see

Bulick et al. 1989). The environment included office cells, a conference room, and social spaces at both sites, which were always connected and available for spontaneous interaction. Users would prompt action by activating 'a call', which enabled a private office-to-office connection (with shared video, audio, remote camera control and the possibility to share documents) or a 'look around' video-only option.

Similarly, Bellcore's design for a *VideoWindow* (see Fish et al. 1990) consisted of a large video display with live audio between two floors of a research lab, which remained continuously open over three months. The aim was to support informal social interaction among the fifty employees. The *VideoWindow* was therefore placed by the coffee-making facilities and close to where the internal post was gathered. Staff would either pass by or engage in spontaneous conversation with those locally present or mediated via the *VideoWindow*.

Another project of interest is Bellcores' *Cruiser* (see Fish et al. 1992), which supported informal interaction between researchers whose offices were connected in real time using cameras, displays and computers. The design was modelled on the idea of walking down a corridor ('cruising') and popping one's head into someone's office space. The display featured the person passing as if s/he had 'popped in'. During a 'cruise', both the observed and the observer could choose to switch the cruise activity into a two-way private conversation.

A three-year project at the University of Toronto, *CAVECAT* (*Computer Audio Video Enhanced Collaboration And Telepresence*) explored remote collaboration based on the Xerox EuroPARC's *RAVE* system (see Mantei 1991). Ten office cells and lab spaces in one building were supported, and the focus was on facilitating shared activities such as writing or drawing supported by video-mediated presence in the media space. Another focus was to support groups distributed over more than two sites (Sellen et al. 1992).

Yet another similar design is Bruce Blumberg's *ALIVE System* (see Maes et al. 1996), which Mitchell (2000: 35) has referred to as a "large 'magic mirror' in which full-scale live video images of inhabitants interact with computer-generated 'pets' and other animated elements."

More recently, a Paris-based design practice, HeHe, run by Helen Evans and Heiko Hansen also use the metaphor of a mirror in a project called *Mirrorspace,* which uses remote communication to create a sense of shared space (Roussel et al. 2004). In its work, HeHe refers to the artist Dan Graham, who has used time-delay machines in mirror-based installations to let viewers see themselves both as subjects and objects (ibid.).

65. 'Mirrorspace', by the design group HeHe, 2003. Paris galleries Main d'Oeuvres, the Pompidou Centre and later La Villette were used as venues. Lucy Bullivant reflects: "Enabling remote participants to look into each other's eyes, the work has a screen and a mini camera at its centre. This set-up is repeated in a second installation, so people who look in the mirror can communicate with each other. An ultrasonic sensor calculates the physical distance that separates the spectators and, depending on how far away they are, will blur the images returned in real time. The two reflections are blended together on the surface of the mirrors, transforming the visual contact between two people and altering the space between them." (2007: 10)

66. *As people move closer to one another (the physical distance represented by the 'Mirrorspace'), the effect of the installation changes from facilitating peripheral awareness (blurred image) to fostering a more intimate mediated interaction (picture in focus). (Bullivant 2007: 10)*

67. *The 'Mirrorspace' installed on an advertising panel in the street shows two participants looking into one another's faces and the image sensors in the centre of the display. (Bullivant 2007: 10)*

Another project of related interest is the *Hole in Earth* installation by artist Maki Ueda, who created a permanent mediated extension between an urban public spaces in the Netherlands with a mosque in Indonesia throughout the year of 2004.

68. *The 'Hole in the Earth' installation by Maki Ueda linked an urban public space in Rotterdam, the Netherlands with a popular mosque in Bandung, Indonesia by establishing a video 'hole' through which people could see and hear each other in real time. Both 'holes' exchange real-time sound and image via the internet. (Ueda 2004)*

Reflecting on the project, Ueda writes:

> The uniqueness of Hole in the Earth owes very much to the character of the space in Daarut Tauhid. People are active at the square and on the street day and night. People are

> responding spontaneously, openly and friendly. There has been always somebody waiting for Rotterdammers to show up. Pitty thing was that Rotterdam Hole is not located in the popular place like Daarut Tauhid. What made the installation extra symbolic was that the sound from the Daarut Tauhid mosque was audible in the middle of the city of Rotterdam, and people in the image are wearing the exotic muslim costumes in vivid colors. [114] (Maki Ueda)

Architects Marisa Yiu and Eric Schuldenfrei use time-lapse video in projects which investigate how the built environment shapes social relationships. Their 2006 *Chinatown WORK* included an interactive facade for a bank (Yiu & Schuldenfrei 2006).

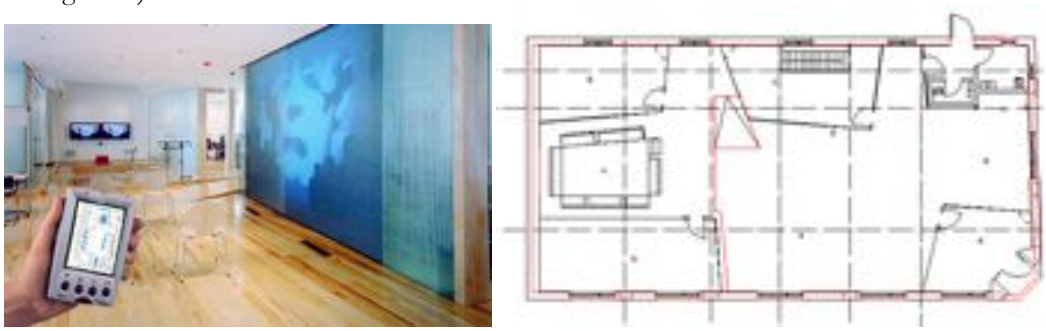
69. A mediated facade for the HSBC bank on Canal Street, NY (2006), by Architects Marisa Yiu and Eric Schuldenfrei. Real-time video and software allows a computer to generate and control masked images, enabling a camera (in a window across the street) to identify the movements of passers-by, by creating an outline of their bodies and then replacing these with time-lapse footage, from, for example, a fish market. The resulting composite images are projected onto the screen, changing its texture and image in real time as people walk by. (Yiu & Schuldenfrei 2006)

Similarly, the New York-based industrial design consultancy Antenna Design, founded by Masamichi Udagawa and Sigi Moeslinger, uses audiovisual media to explore public participation in urban contexts. Interviewed about the difference between designing physical and screen-based interfaces, Udagawa says, "We generally view the physical and digital elements as inseparable." (Heller & Womack 2008: 261) Their 2004 *Civic Exchange* project proposed a piece of interactive street furniture in Battery Park, New York: a horizontal touch-screen table top that would allow users to place their own landmarks on a map, respond to community issues, and where news, events, alerts and other information would be published to stimulate place-based education and foster communication between members of the community (Udagawa & Moeslinger 2004).[115]

Architects Waldvogel and Huang run a practice called Convergeo, based in Concord, Massachusetts, US and Lausanne, Switzerland, and have specialized in "smart environments and spatial elements that combine physical and digital technologies". Their interior design for the Swiss Consulate in Cambridge, Massachusetts (2000) illustrates how large surfaces can be used to create an integration of media technology and architectural elements. They refer to the surfaces as 'interactive wallpapers' which "visualize the presence of the diaspora [of Swiss scientists around the world], capture conversations, leave traces of encounters,

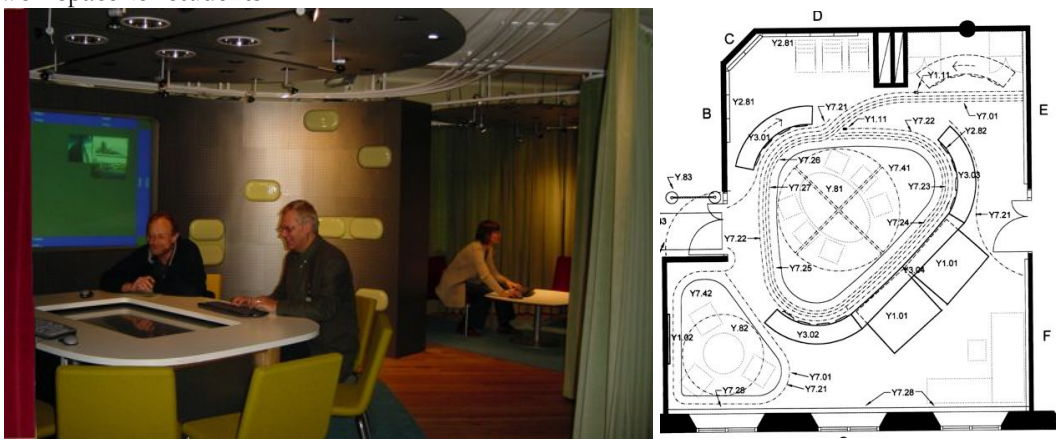
[114] Ueda also describes a spontaneous shared performance space: "It was around 11: 00 PM in the end of June 2004. I went to the Hole in the Earth after dinner with my friends. 'Hello-!' Nobody was there. Again, 'Hello-!' Somebody showed up. Few seconds later, a couple of more people all of sudden showed up. He must have called the people around. The sound on the Rotterdam side was switched off because it was late at night in Rotterdam, but we somehow communicated by using fingers and unique expression on the face. We put our ears close to the speakers, so that we could somehow hear something from Bandung - somebody was playing a drum especially for us! We accompanied by clapping and dancing. Unexpectedly, we held a small festival beyond 10.000 km distance. It was pretty windy and cold night, but we were totally warmed up by their warm heart and tropical smiles."
[115] Cf. review in Bullivant 2007: 21ff.

identify and localize viewers, create sediments of thought or simply amuse" (Waldvogel & Huang 2000).



70. Back-projection is used to create 'interactive wall-paper' at the Swiss consulate in Massachusetts, US Cameras are placed in several locations, e.g. to the left of the large wall, and between the two displays at the far end, facilitating worldwide, remote interaction. Designs by Convergeo. (Waldvogel & Huang 2000)

Similarly, my own designs for the *iLounge* media lab (2002), below, for a group of researchers in ubiquitous computing, illustrates a combination of spatial and technical design to enable remote participation and collaborative work around an interactive table. The *iLounge* provided both a research environment where new solutions could be tested and a workspace for students.[116]



71. The iLounge was designed as an experimental research facility for the Fuse research group, KTH/IT-University, Kista, Stockholm. Back-projection, smartboards and plasma-screens were incorporated into horizontal and vertical surfaces. A multiple curtain system (visible in the floor-plan) and perforated wall elements allowed for temporary layouts, projections, backdrops, and changes in colour and light settings, according to the needs of the research projects. (Gullström Architects 2002)

Architect Holger Schnädelbach and colleagues at the Mixed Reality Lab of the University of Nottingham approach mixed reality from an architectural perspective and have developed a commercial concept called 'mixed reality architecture', which enables continuous and real-time, video-mediated connection between office workspaces (Schnädelbach 2007; Schnädelbach et al. 2007). In this concept, office workers, who each dispose of an office cell, also share a virtual open plan workspace. A video-mediated projection from each office cell is brought onto a large display, which also features a shared virtual space.

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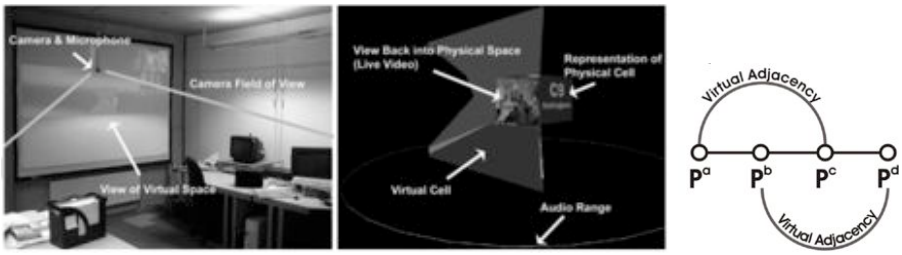
[116] For a description of how the space has been used, see research leader Carl-Gustaf Jansson's chapter 'Ubiquitous Working Environments' in Lahlo 2009: 191ff.

72. Mixed Reality Architecture. Interior of an office cell where the virtual space is projected on a wall. (Mixed Reality Architecture 2009)

The concept is based on linking and overlaying multiple physical and virtual spaces that have three spatial dimensions and one temporal dimension, in ways previously tested (Benford & Greenhalgh 1998). Rooted in space syntax theory, the concept is founded on the 'elementary architectural cell' as "the smallest building block that architectural structures consist of" (Schnädelbach et al. 2007). According to Bill Hillier and Julianne Hanson's space syntax theory (Hillier & Hanson 1984), a cell establishes the two categories of 'inhabitants' and 'strangers', where inhabitants can authorize entry to an architectural cell, thereby turning 'strangers' into 'visitors'. Schnädelbach et al. argue that the principles of space syntax theory also apply to virtual space and to the combination of physical and virtual 'architectural spaces', i.e. 'mixed reality' architectural design. Considering the topological limitations which determine the adjacency of physical spaces (Steadman 1983), adjacency is a prerequisite for visibility and accessibility between cells in real space. Space syntax theory translates this into spatial configurations and shows that visibility and access between spaces determines how well spaces are integrated in a spatial system (Hillier 1996), which in turn affects patterns of movement and interaction.

Schnädelbach et al. (2007) discuss the implications of what happens when architectural topologies are made dynamic and extended into virtual space. In their concept, the MRACell (Mixed Reality Architecture Cell) is owned by an inhabitant who is in control of the boundary and its relation to the exterior spaces: the domain of strangers as well as the domain of encounters between strangers and inhabitants. A key function of the cell is to establish co-presence between two or more people who are present at the same time. They define the MRACells as spatial units "consisting of one physical and one virtual spatial cell, which are permanently joined together" within which people are regarded as co-present and able to maintain a symmetrical relationship in social interaction (ibid.).



73. 'MRACell' in physical space (left) and in virtual space (right); and an illustration of 'Multiple virtual adjacencies'. (Fig 1 and 6 in Schnädelbach et al. 2007)

Schnädelbach et al. use the term 'multiple virtual adjacencies' to define the spatial integration of physically non-adjacent spaces, and conclude that "topological adjacencies across virtual space change the integration of the architectural spaces" and "the placement of MRA technology in different parts of an office space (deep or shallow) impacts on the nature of that particular space" (2007). In discussing how 'virtual extensions' may be used to promote interaction in architectural design, for example, in an existing building that might be hard to adapt, they reflect "that architecture in general should take virtual space as extensions to the physical building fabric more seriously (...) but would have to consider the topological and interactional effects of such extensions in a fundamental way." (ibid.)

In conclusion, it may be said that whereas Schnädelbach et al. apply space syntax theory to mediated spaces, they do not provide recommendations for the design of mediated spaces. In line with other space syntax researchers, their focus is on how a retrospective analysis may inform design, but the design issues are, more or less, left to practitioners.

The aim in this section has not been to provide a complete list of all media space followers.[117] The applications of media space have been many and include different contexts of work and learning (such as e-learning, telepsychiatry, telemedicine, teleworking, telepresence, etc.). The intention here is primarily to outline the formative years of a few research environments that involved architects. A further goal was to understand what architects, specifically, have contributed to the topic.

Schnädelbach's important contribution of a framework for 'mixed reality architecture' is based on an understanding of architecture 'as structuring patterns of co-presence' and the notion that architecture has an impact on who one encounters and who one avoids in everyday work-life (Schnädelbach 2007). The challenge for Schnädelbach, as for space syntax theory, concerns the stability and inflexibility of architecture in a time when organizational change is increasingly rapid in current work-life (Penn et al. 1999); and how to adapt buildings to meet these changes. The emergence of a 'network society' – where digital networks are based on existing values, interests and projects – demands that we consider both global and local aspects if we are to understand society's new properties (Castells 2004). Inclusion in the network society is critical, and though it is spatially dispersed, it still often depends on physical location and physical proximity. As Hillier & Hanson have shown, architectural structures have an ordering effect on human behaviour: they affect the adaptation of existing social rules as well as the generation of new ones (1984). Space syntax analysis applied to existing workplaces (and their various designs and layouts) shows a strong correlation between spatial regularities and the movement and interactions amongst individuals. In turn, spatial design will affect issues such as co-presence and co-awareness and the sense of belonging to a group within an allocated space (Hillier 1996). As pointed out by William Mitchell, the 'civic legibility' of architecture makes interaction within it legible, and therefore accountable (1995).

While architecture has a clear structuring effect on co-presence as the pre-condition for social interaction, Schnädelbach argues that it is static, inflexible and "at odds with a very flexible and rapidly changing society" (2007). Instead, the concept of flexibility is provided by communication technologies in their different forms. But because the social interaction

[117] For an overview, see for example Ehn et al. 2007; Harrison 2009; Sawhney 2000; Dourish 2004; Baecker 1993.

they provide remains hidden from view, there can be no 'civic legibility' of social interactions via the telecommunication technologies that we mostly use.

Schnädelbach's research therefore aims at combining the spatial and 'configurational' qualities of architecture with the dynamics of communication technologies, in order to observe the effects that these two have on social interaction within 'mixed reality' spaces. His research focuses on two interrelated questions: "How can architecture be made more dynamic to be able to respond to organisational change? How can social interaction across multiple physical spaces as supported by communication technologies be made more like social interaction that occurs within the framework of physical buildings?" (2007)

For Schnädelbach, the advantage of 'mixed reality' is the possibility to support social interaction by embedding people –who are physically remote from each other – within the same spatial framework. He shows that this is performed better in 'mixed reality' than in strictly virtual environments. While previous research, which has mostly focused on interaction in virtual environments, has pointed at the possibility for chance encounters and interactions between people who are physically distant from each other (Benford & Greenhalgh 1998), it also showed that activities in physical and virtual spaces influence each other and that both sides of the interface are equally important (Bowers et al. 1996). Whereas previous attempts to address mediated interaction in 'mixed reality' environments have emphasized either the physical (such as 'augmented reality' in Feiner et al. 1997) or the virtual (such as 'augmented virtuality' in Reynard et al. 1998), Schnädelbach calls for researchers to treat physical and virtual spaces as equally important. He stresses the importance of making the different spaces available to everyone by clearly establishing the 'boundaries' between the physical and the virtual. Schnädelbach summarises that the key result of his research is to show the direct and immediate relationship between architectural typology and social interaction. He describes 'mixed reality architecture' as 'a novel architectural concept' characterized by its configurational properties, which impact social interaction:

> Its topology consisting of physical and virtual spaces allows geometrical architectural limitations in physical space to be overcome. Virtual spatial adjacencies between local and remote spaces result in changes to the topology, which are then shown to influence movement and social interaction. At the same time, as social interaction is embedded within a virtual spatial framework, new limits on adjacencies are the result, which, it is argued, can only be completely overcome once telecommunication reverts to providing no internal spatial framework. The Mixed Reality Architectural Cell, the novel architectural interface developed for this research, is itself spatially dynamic. It enables and controls social interaction between people who are not physically co-present. No spatial relationships are predefined between multiple MRACells, making the resulting architectural configuration entirely dependent on the interaction of its inhabitants. (Schnädelbach 2007)

Schnädelbach stresses the dynamics of this new architectural topology, which spans virtual and physical spaces. In comparison to physical architecture, the relationship between spatial topologies and co-presence is more direct and rapid. In order to establish co-presence for social interaction, the architectural topology is actively reconfigured, by bringing MRACells sufficiently close together for interaction to occur: "To establish co-presence for social interaction, the architectural topology has to be re-configured in such a way that brings different architectural spaces close enough together. In turn, the resulting architectural topology, as established by its inhabitants on the fly, enables or prevents social interaction that might follow." (ibid.)

design example:
a mediated therapist

74. The doctor in her office, as the patient encountered her. The therapist could not see the patient well if they were standing too far from the furniture piece, so she would ask them to sit down as soon as they entered the room. The therapist expressed that with this technology, she could follow gestures and eye movements as well as she could when she conventionally shared a room with the patient.

The design example of the *Mediated Therapist* was briefly introduced in Chapter 1.[118] Carried out as a user study over a period of three months in 2008, the mediated workplace enabled the therapist to perform her work as well as she would have in a real space facing the patients. In effect, the doctor experienced mediated therapy as less mentally exhausting than conventional practice.[119] Further, the study showed that the patients' health improved as well and that they expressed a positive experience of remote presence and mediated therapy.[120] Other studies in telemedicine and telepsychiatry similarly indicate positive results.[121]

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[118] This user study was carried out as part of the Mediated Spaces Project; see Appendix 2. In addition to me, the following people contributed to the design and user study: Leif Handberg, Arild Jägerskogh, Agneta Ekman, and patients.

[119] A similar effect was noted by de las Cuevas et al. 2006. A sequence of CBT sessions in real space would leave the therapist quite drained at the end of a workday, whereas the mediated workplace provided adequate support for professional assessment, yet negated the experience of negative effects.

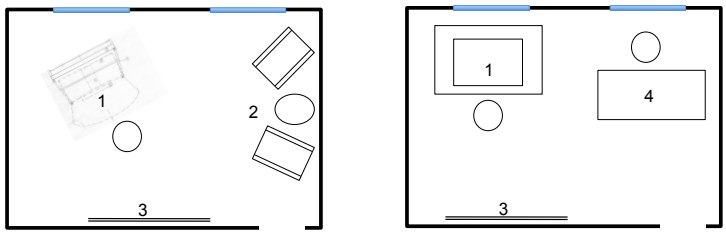
[120] The most common diagnoses reported were major depression, dysthymic disorder and generalized anxiety disorder (GAD). Five had bipolar depression. Most patients were treated with antidepressants and/or mood stabilizers as part of CBT. After seven therapeutic sessions, patients' satisfaction and impression of the mediated therapy treatment were reported in a questionnaire, from which positive results were concluded. I also conducted five interviews with Dr Ekman and with five patients. Ekman (2009) reported 85% patient improvement

Mutual gaze and framing

What distinguishes this particular design example and user study is the possibility to achieve mutual gaze. Interviews with patients who participated in the treatment confirmed a strong sense of presence, and several expressed that they sometimes forgot the doctor was somewhere else. A combination of life-size projection, the possibility for mutual gaze, an overall integrated design and a welcoming environment contributed to this experience.[122] Furthermore, the design explicitly provided a situation where the patient 'was seen' and where, perhaps, the doctor's gaze was more prominent than in a shared real space. The therapist was aware that gazing was an important and noteworthy feature, and experienced that the remote therapy sessions indirectly provided an opportunity for training patients with cognitive disorders. Failure to develop typical mutual gaze behaviour is one of the earliest signals of severe social and communicative disorders, or of autism (e.g. Senju & Hasegawa 2005: 128). The distinct framing provided by the design, which excluded other, perhaps less important objects and parts of the room (outside the camera view), contributed to a sense of focus and proximity in the conversation, both of which are integral to shared mediated spaces. This observation is also confirmed by my other design experiences (e.g. M*ediated Unemployment Services* and the *Mediated Museum*), where remote participants expressed that gazing in mediated spaces is more intense than in real spaces. A likely explanation is that the designed mediated space makes both parties aware of the limitations of shared mediated space: if you look (or walk) outside this area, your adversary does not know what you see (or where you are).

Spatial layout

The illustration below shows the layout of the mediated consulting room and the therapist's office, respectively. This representation follows the convention in architectural design, where the placement of different furniture is indicated. One could also choose to represent what the camera captures in each location, as shown in the subsequent illustration showing the section view. The *shared mediated space* which emerges as the two rooms are joined can also be referred to as a *spatial montage* and represented as such.



75. The layout of the two rooms, each of which measured 3,2 x 4,5 m. Key: (1) the mediated extension; (2) Sitting area; (3) Backdrop (same in both locations).

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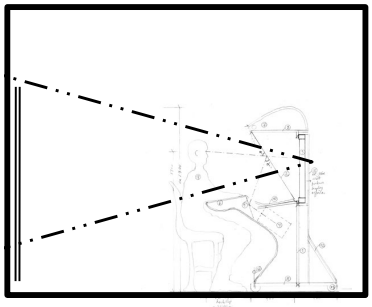
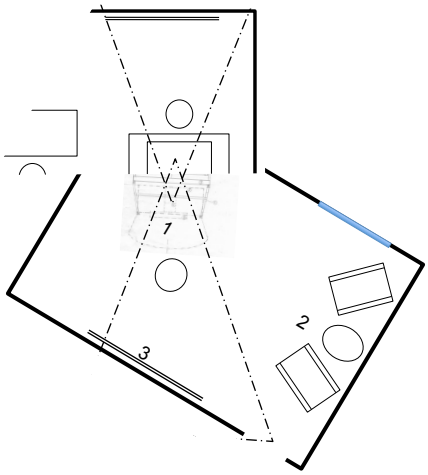
measured in MADRS (0-11) and HAD (0-6), in accordance with previous studies regarding the effectiveness of telepsychiatry.

[121] For an overview of the extensive body of research in telemedicine, see e.g. Latifa 2008; Sinha 2000; de las Cuevas et al. 2006. For telepsychiatry, see Gunter 2009; Norman 2006; O'Reilly et al. 2007. The benefit of telemedicine in remote areas, where medical infrastructure is poor, frequently due to lack of resources and to the difficulty of attracting expertise to serve the area, is reported in Canada (Morazin 1997). Results demonstrate that patient response to telemedicine is overwhelmingly positive, above 90 percent (e.g. Dick et al. 1999). Keating & Mirus (2003) report positive results from mediated spaces that enable deaf people to communicate using manual visual language, in many cases their native language, across space and time zones.

[122] It is very likely that the context of use was also a contributing factor: all patients were ill and very grateful for the possibility to receive faster treatment through participating in the study. Interviewees expressed a feeling that the charisma of the therapist was a contributing factor. The 20 patients, ages 20 to 78 years, were referred to the study by general practitioners and psychiatrists in the Stockholm area.



76. The section illustrates what the camera captures of the room.



77. The shared mediated space which emerges as two rooms are joined can also be represented as a spatial montage.

A focused form of collaboration: frontal vs. lateral

With reference to the first mediated workplace designed at Xerox PARC, which I described in Chapter 3, one could characterize this mediated workplace as a *sustainer,* not suitable for a 'close working relationship', which was the case at Xerox PARC, but for providing the delicate intimacy and trust which an interaction between therapist and patient requires. The patient, we may conclude, was not here, yet, sufficiently near, to facilitate the establishment of trust. This environment was also sufficient for the doctor to perform actions and form judgments based on her professional skill. If mediated spaces can facilitate a high level of dialogic interaction, there is reason to further discuss how presence design can be integrated into collaborative work and learning environments where the exchange of practical knowledge is crucial.

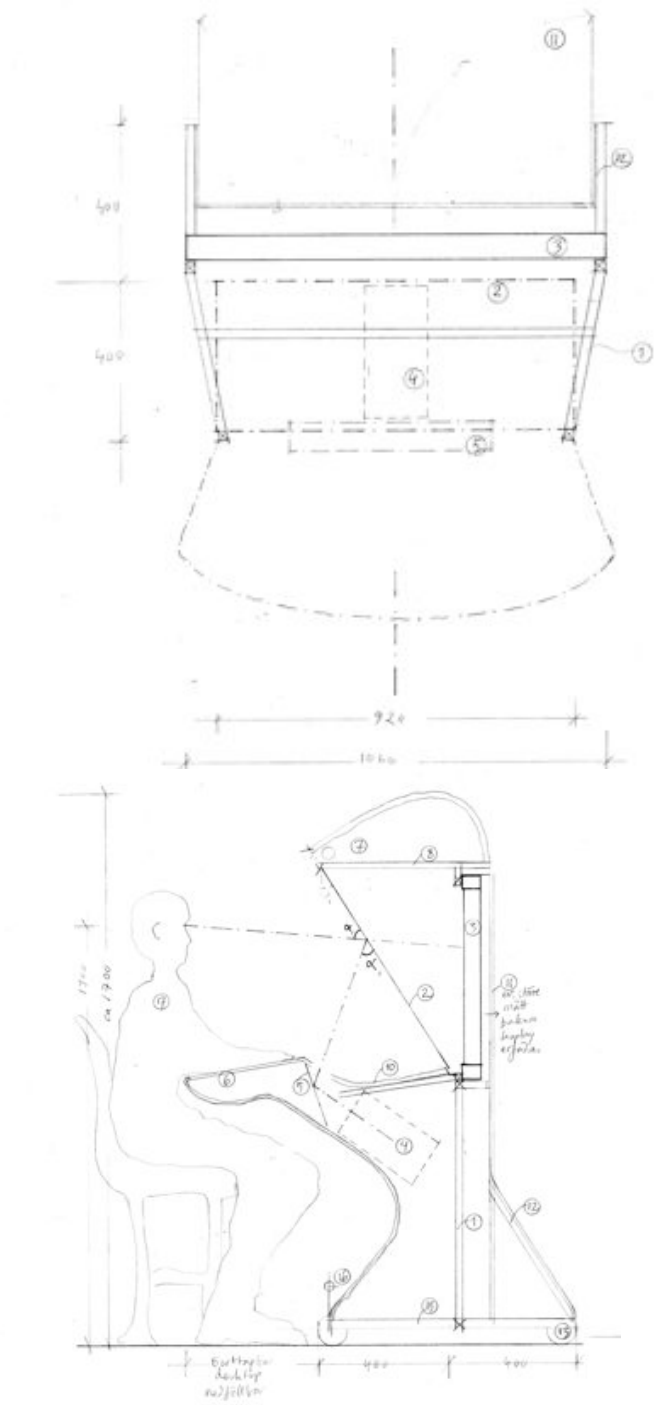
Further, the example of the mediated therapist illustrates a focused form of collaboration, where both parties are concentrated on the interaction. However, such face-to-face interaction, which I will refer to as *frontal* interaction, is only one of many cooperative activities that distinguish teamwork. I will distinguish between *frontal* versus *lateral* forms of collaboration that can be supported in workplace design. Heath et al. have, in fact, stressed that frontal interaction constitutes a relatively small part of working together. It is only "one amongst a diverse configuration of spatial and bodily arrangements through which personnel participate in each other's activities and accomplish the 'business at hand'" (Heath et al. 1995: 177). From their observations of Xerox PARC's *Media Space*, they conclude that "video technology which primarily provides a face-to-face orientation to users, fails to support peripheral monitoring and peripheral participation, does not provide access to tools, artefacts and the users' local environment, and introduces unanticipated asymmetries into the

interaction between users, is unlikely to support even the most basic forms of organisational work." (1995: 177.)

In turn, lateral forms of collaboration facilitate peripheral monitoring and awareness in relation to a shared artefact. When office workers sit side by side, they are "continuously sustaining a shared focus on an aspect of a screen or paper-based document, such as a section of an architectural drawing" (ibid.: 176). This quote reminds us that architects were involved as users in the Xerox PARC prototyping process. In effect, sketching together is a crucial part of architectural practice and it is well characterized by Heath et al., who summarize that it is not necessarily important to see what another person is seeing, "but rather seeing the other in relation to what he or she is looking at and doing" (ibid.: 178).

I will return to how mediated spaces may support peripheral monitoring and awareness in different examples. The following two workplace examples were equally designed to support frontal collaboration, but also to facilitate awareness of people in remote locations. In the example of the M*ediated Therapist,* it was important to exclude any disturbances, hence two small rooms that could be closed were chosen. The piece of furniture was, however, originally designed to suit an open plan workplace, as we will see in the next example.

78. On the back of the furniture piece a panel can be removed to allow monitoring of the various equipment that captures, transmits, and represents a remote location.



VERTIKALSNITT

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	Möbelformgivning distansmötesplats Projektet Service, utveckling & kommunikation Arbetsförmedlingen Norra Dalarna	CGH 1:10 (A4)
	STI395	SKISS

79. Plan and section of the furniture used in the mediated therapist's office, originally conceived for the mediated unemployment offices (described in the following pages). Key: (1) Welded steel framework; (2) Semitransparent glass, with a special coating ('beamsplitter'); (3) 42" plasma display; (4) Video camera; (5) Mirror (placed at an angle to allow the camera lens to capture a user at eye-height, via the 'beamsplitter'); (6) Desktop, can be lifted to reveal a drawer, with additional equipment; (7) Light fitting. (Gullström Architects AB)

design example:
the mediated unemployment services

80. Assessment of the design prototype in the carpentry workshop.

Eight different Unemployment Centres across the Dalarna region of Sweden participated in this project, which aimed to provide better services to job-seekers in small towns and villages where the opening hours had been steadily reduced in recent years. As mentioned in Chapter 1, our project group sought to find the best suitable way to extend the offices, in order to serve the work activities at hand. We worked closely with members of staff to find out how a mediated workplace could facilitate their work, and to discuss how work in mediated spaces compares to work in real spaces.

A typical workday for many contemporary office workers may be described in terms of moving through a procession of virtual spaces, whilst remaining seated at a desk in the office. We open up windows on computer screens, allowing us to navigate across the Internet, and telephone conversations establish temporary spatial extension to remote places, if only acoustically. While most office workers today are accustomed to many of these experiences, our ability to negotiate these different spaces is sometimes taken for granted. In the picture above, I am in conversation with Björn Persson, an unemployment officer, in the process of assessing a design prototype in the carpentry workshop. In order to understand and visualize his future workplace, I addressed him from the perspective of a job-seeker who would be received at his desk. What concerned Björn before the dramatization was how he

would manage different tasks whilst simultaneously engaging in several interactions. He couldn't easily foresee how he would cope with a remote party in the event that he was already dealing with someone in person. I had previously attempted to explain that it would be the same as if, in his present workplace, the telephone rang while he was busy with a job-seeker – or if someone called out a question, or jumped a queue, when he was already in a meeting. Because Björn had difficulties visualizing how the mediated space would affect his work situation, it was difficult for the two of us to address other issues relating to design, location and user. With the prototype at hand, however, the comparison could be made to an incoming phone call disrupting a face-to-face meeting.

Who meets whom?

Among several other concerns raised as part of the design process, we frequently discussed how remote job-seekers would be received. It was important to avoid the problem that could arise if an officer was already busy in a meeting. This concern would also affect the location of the furniture. The sketches below were made to document our discussions with users in the process. Should a visitor first encounter an overview of the remote unemployment centre? No, it was deemed important that a person receive the incoming client. But would it be possible that a remote officer acknowledges a new customer, as a 'remote receptionist', asking him/her to wait a moment? To provide a visitor merely with information such as: 'Please wait, it is soon your turn' was considered too poor a solution. With time, a system of turn-taking was agreed upon, in which the two main offices shared the role of receiving customers, and a queuing system was introduced. My sketches below are selected among many that I drew as part of these discussions in order to document the dilemmas that were raised.

81. The challenge of combining several different media in the workplace, when face-to-face meetings take place both in real spaces and mediated spaces. Here, a message flashes on the desk of an officer who, at the moment, is busy with a job-seeker: "Incoming visitor in [the town of] Orsa!" The officer sends a message that s/he can receive a remote visitor in about five minutes.

82. A person is at hand as soon as a visitor approaches. Top: "How may I help you?" Below: "I am here to meet an unemployment officer." The first notice tells visitors to press a button to activate the remote meeting place.

83. A photo combined with information. Left: "You will soon be connected to an officer in [the town of] 'Orsa'. The waiting time is 5 min. Please take a seat and register your personal identification number." Right: "Please take a ticket."

As a job-seeker arrived at the Unemployment Centre in one of the smaller villages, the door would first be closed. The visitor would draw a ticket from a dispenser by the door, which would open once it was his/her turn. On entering the space which contained the piece of furniture, the officer would be available for a face-to-face interaction. In the larger unemployment centres, visitors would enter a fairly large open plan workspace, where one or more officers were at hand for registration.

The photo below, from the Unemployment Centre in the small town of Vansbro, shows how the remote meeting-place was first placed as part of the open plan workspace. In the course of the project, however, all the remote meeting-places were moved to secluded rooms in order to secure privacy in the dialogue between job-seeker and officer. This was a general concern that we raised in our initial observations of the activities at the job-centres. Another reason for this separation was to enable other organisations to make use of the remote meeting-place. These spaces were also regarded as an opportunity to facilitate communication amongst small companies and individuals in remote areas outside the opening hours of the Unemployment Services.[123]

84. A visitor to the unemployment centre in the town of Vansbro encounters an open space. Left: Photo from 2004, before it was a mediated open plan workplace. The sign says 'Customer workplaces'. Right: The remote meeting-place in the unemployment centre in September 2005, at the time of its formal inauguration.

[123] The social security centres in Dalarna led to discussions regarding remote healthcare, which have been on-going in this area, where access to medical expertise can be scarce and the journey to the nearest hospital very long. The drawer beneath the desktop was intended for such alternative usages: we expected that equipment, for example to measure one's blood pressure before a remote doctor, could be kept here.

85. A meeting took place in 2005 to assert that the meetings facilitated by the remote meeting-place could be classified as meetings.

Increased public access

As an example, the weekly opening hours in Vansbro previously amounted to twenty. In October 2005, as a result of the mediated unemployment services, the hours were increased to twenty-three, following the schedule below:

Opening hours in Sälen, Vansbro and Malung (an area hosted by the larger unemployment centre in Malung) from 3 October 2005:

Mondays 9-12 AM, 1-3 PM	Vansbro is serviced by staff all day. Sälen is serviced from Malung 9-12 AM.
Tuesdays 9-12 AM, 1-3 PM	Vansbro is serviced from Malung all day. Sälen is serviced from Malung 9-12 AM.
Wednesdays 9-12 AM	Vansbro and Sälen serviced from Malung 9-12 AM. (The services are closed Wednesday afternoons)
Thursdays 9-12 AM, 1-3 PM	Vansbro is serviced from Malung all day. Sälen is serviced from Malung 9-12 AM.
Fridays 9-12 AM, 1-3 PM	Vansbro is serviced from Malung all day. Sälen is serviced from Malung 9-12 AM.

(Nederberg 2005)[124]

86. The effect of the mediated services was even greater in some of the smaller villages, such as the ski resort Sälen shown above. The lit space under the sign 'Arbetsförmedlingen' is the unemployment centre, where opening hours had been reduced to two mornings every other week. A ticket dispenser was later placed by the front door, which opened remotely, and was monitored by the larger Unemployment Centre in Malung.

The stipulated number of hours that an Unemployment Centre must provide public service has been reduced over the years. In the case of the Dalarna Unemployment Services, there was a declared public interest in providing meetings with an officer in person. When the mediated unemployment services in Dalarna were inaugurated in 2005, I attended a meeting in Vansbro, at which politicians and officials representing public services in the region were asked to assert that a meeting across the remote meeting-place could be classified as a 'personal meeting', which they did.[125] One of the participants, the Director of the Dalarna County Labour Board, Michael Leufkens, later asserted in a public media statement: "In the smaller towns, access is significantly increased by these measures. Now we offer personal conversations every weekday, even in the most remote areas in the north."

[124] Schedule presented by Eva Nederberg, manager of the Unemployment Services in Malung.
[125] The meeting took place 12 September 2005, initiated by Eva Nederberg.

(Uppsala Direkt 2005) Another participant, Elisabeth Ljungdahl-Björk, assistant manager of the Unemployment Services in Dalarna expressed: "It does not feel as though I am standing in front of a camera. It is more like if I am talking to a person on the other side of a sheet of glass." (Dalarnas Tidningar 2005)

The number of personal meetings that have taken place via the remote meeting-place now exceeds twenty thousand, and the project has attracted a lot of interest, not least because it shows that mediated services can benefit public access (Henriksson & Räsänen 2010).[126] As the newly appointed director of a research centre in 2007, which had a mission to develop communications services that provide viable alternatives to travel, I initiated a limited sustainability assessment study to investigate the potential positive effects in terms of sustainability that mediated spaces could have on the environment (Moberg et al. 2008). It confirmed that public access was improved as a result of our project and documented a positive experience from both job-seekers and staff, in terms of reduced travel. Further, it was assessed that the environmental impact of the operations had decreased, primarily due to a cut in expenses, in saving time, and reducing the demand for fuel. In spite of the effort to consider the economic, ecological and social parameters in this limited sustainability assessment, it did not address the workplace-related (hence social) design aspects that were explored in the first part of this chapter, which arguably have an effect on our ability – as individuals or organizations – to change patterns of behaviour.

A mobile piece of furniture or a mediated window?

To equip workplaces in different geographic locations with a remote meeting-place may prove fruitful for some organizations that aim to reduce the need for travel. While the remote-meeting place described here was mobile, height-adjustable, and embedded with a hearing loop, and many spatial considerations were taken into account, it is quite different from an office that is spatially extended by means of an integrated interior design. In comparing a mobile piece of furniture with a design strategy that establishes a sense of 'a shared interior space'. A few noteworthy conclusions can be drawn from the earlier example of the 'half-meeting rooms' design for a Swedish telecommunications firm. Distributed across three countries (Sweden, UK and US), the need for shared values was represented by a mediated work environment with similar design (see illustration 27). In other contexts, an overarching design strategy may cause confusion, since it may not be possible to discern the geographic location from which a colleague speaks. Such scenarios sometimes call for a clear distinction to be made between the parties involved in mediated interaction.

In the case of the *Mediated Unemployment Services*, a need to identify each geographic location soon emerged. It was solved simply by attaching a label to each backdrop, visible to the remote party, but it still indicates a spatial confusion that was left unaddressed during the design process.

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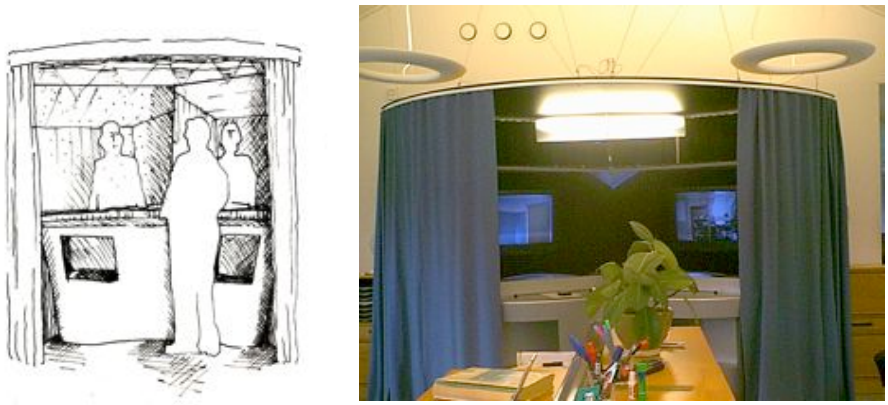
[126] Public interest in further developing mediated public services is documented in a Swedish Government Official Report, 'Se Medborgarna. Slutbetänkande av lokal service i samverkan' (Högdahl 2009).

87. The sign indicating the town of 'Älvdalen' behind the remote party is a result of the need to identify each geographic location.

The need for a label to reinforce geographical identity may also be considered unreliable, in the sense that any label could be put up as part of a mediated spatial extension. If there is a 'false sense of (re)location', users may be left insecure about the actual location of the furniture piece. Because the furniture has wheels, the meeting place can be moved to a different part of the workplace, which suggests that it is place independent. Like a window provides any view, it looks onto any space. At the same time, the furniture piece itself lacks the ability to extend one space into another, since it provides no helping hand in linking two spaces. Like a window or a door, it merely connects two spaces, which may or may not have a correlation with one another. This can be considered as a shortfall in terms of the furniture's ability to achieve mediated presence and spatial extension, because its mobility affects the user's ability to establish a sense of relocation, a sense of 'being there', rather than 'here'.

My next design example illustrates a piece of furniture which can be considered as a 'window', 'doorway', or an opening between workplaces. In contrast to the previous example, we will observe a remote meeting place which has been fixed to a specific location in the workplace, where its function has been deemed useful. A significant difference between the following example and the previous two examples is its specific aim to facilitate informal meetings and casual socializing in the mediated workplace. As previously noted, collaborative practices are, to a great extent, characterized by lateral and peripheral monitoring, rather than frontal interaction. Further, the examples we have observed so far both illustrated formal meetings, which followed a ritual defined by their operations. The next example also made formal meetings possible, but had the additional aim to facilitate informal and social interaction between colleagues who felt that they saw too little of each other.

design example:
remote affinity in the archipelago



88. Left: my sketch of the remote meeting bar at Arholma, dated January 2003. Right: photographed as it was executed later in the year.

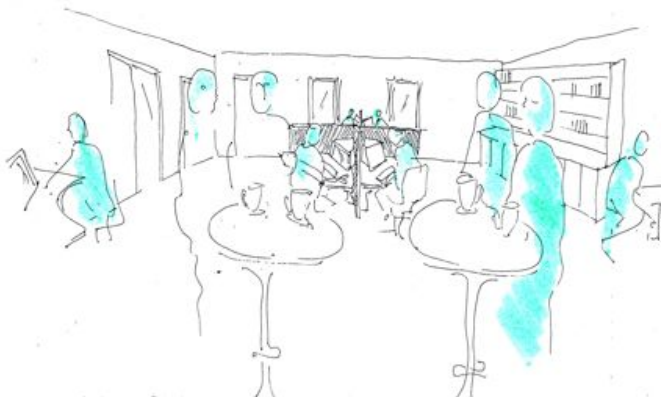
The trouble of existing layouts

Few existing workplaces are designed with the intention that in the future, the office will be extended into another location.

When I first visited the call centres of the Stockholm County Police, located on the three different islands of the Stockholm archipelago, I realized that as an architect, one of my major challenges would be to create one work environment out of three quite disparate interiors. All open plan, each had a different design and colour scheme. The work desks were by acoustic panels of varying height, which allowed little or no overview of the room as a whole. That workplaces are sometimes partitioned in order to shelter individual work rather than encourage teamwork illustrates one of the contradictions of contemporary workplaces: these spaces must facilitate individual work as well as group interaction.

89. The open plan call centre in Arholma. The office layout of the call centres posed a significant challenge to creating mediated spaces, because each workplace was dominated by acoustic screens, which served to shelter individual work.

90. In Ornö, high acoustic dividers limited the possibility of having an overview of the space. The left photo is taken from a seated position, and the right from a standing position, at eye-height.



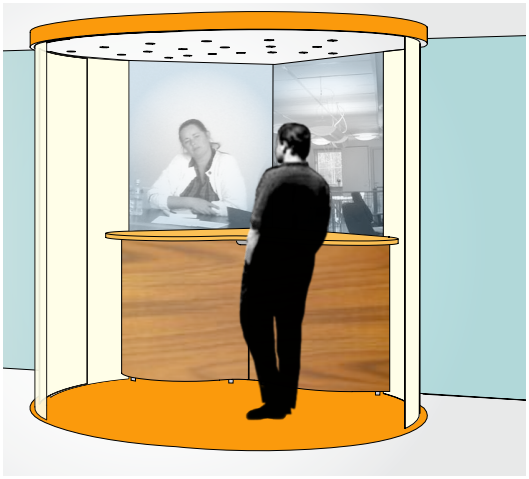
91. My sketch proposing a rearrangement of the workplaces at Ornö and Arholma. This design provides a better overview, as seen from the perspective of a person standing by the meeting bar on one of the other two islands.

To synchronize work activities between the three islands would be impossible, as each had different routines, but the idea of simultaneous coffee breaks was put forward early in the design process. My sketch above shows a proposed rearrangement of the workplace,

with Ornö and Arholma in mind, to create a better overview during shared coffee sessions. In the foreground, people are seen drinking coffee together with colleagues on the two other islands, while in the background, others are still at work by their desks.

92. During the design process, I put forward proposals for rearrangements, some of which were later carried out. Seen above is the open plan work area at Sandhamn before (left) and after (right) a rearrangement of workspaces. The meeting bar was later placed by the staircase, to the right.

Thus, it was mostly due to the different layouts that we opted for a piece of furniture that would be fitted in each environment. The alternative approach of accommodating a mediated extension as, for example, part of an existing wall or a separate room, was initially attempted. As seen from the sketch below, it would have been integrated as part of an existing wall in the open plan work area, but this was not possible, due to the limited space and the structural alterations it would have required.



93. An early sketch (dated 021131) shows initial proposal to integrate the design into an interior wall.

In the course of the project, however, the layout of each workplace was slightly rearranged, both in order to enable a remote view and to integrate the meeting bar with the workplace in such a way that employees would pass by in the course of their errands around the office. This would allow 'passers-by' to take a glance at the activities in the other offices and the opportunity to initiate casual interaction. Every morning, as the first person entered one of the offices and switched on the light, each workplace would be extended to the other two. A continuous space where all parties were both visible and audible to each other was, as previously noted, an important part of the brief. Following these criteria, the bar was designed to support interaction-whilst-standing and awareness-whilst-working, as indicated by the sketches and drawings below.

Although the designs developed through a participatory design process, many decisions were also grounded in my previous experiences of designing collaborative workplaces, where it is often a concern to design spaces that facilitate informal social exchange. The meeting

bars that I had previously designed as part of a 'flex office' or 'teamspace' were typically located near a coffee-machine, by the internal post-boxes, or by the copying machine, i.e. places where people would pass by, stand casually, and were perhaps most receptive to social interaction. In the case of the *Remote Affinity* project, however, it was a deliberate intention to design a bar by which one would stand, rather than sit, in conjunction to one's respective work area. To place it in the coffee area was discouraged because the staff expected that this might exclude its use in a work exchange. It would also intrude on the only space allocated for rest and reflection between the intense work sessions in the open plan workspace.

Lateral and peripheral monitoring

The photos below show that our designs enabled a person to address the two remote parties face-to-face (frontal interaction) whilst also providing an awareness of the remote offices. Passing by, or casting a glance, the extension was visible out of the corner of one's eye (lateral and peripheral monitoring). The combination of our teleprompter-based design (that supported mutual gaze) and achieving sufficient integration with the concurrent work and social activities of the workplace, made it possible for users to sufficiently 'trust the situation', which, I believe, contributed to the sense of remote affinity. In the photo below, researcher Minna Räsänen, a social anthropologist, is in conversation with call-centre employees in December 2004. As illustrated by the photo, the three persons in conversation can turn towards each other, much in the same way, as if they were standing around a bar in the same location. Due to budget limitations, we had to use small basic TV-monitors as part of the final design. What is seen to the right is my photo-montage illustrating the larger displays which were intended. It was also for economic reasons that the Stockholm County Police could not later implement the meeting bar in their many call-centres and why the mediated workplaces in the archipelago were dismantled in 2006.[127]

94. Photo from Sandhamn (left) and a photo-montage illustrating the larger displays that were intended (right). Minna Räsänen, a social anthropologist, in mediated interaction with both Arholma and Norrtälje, where the offices of the Stockholm County Police are located. Manager Sven-Olov Bäcker at Arholma is seen to the left.

Informal interaction and affinity

Several staff members made their own arrangements to see and to be seen. They moved plants and removed bookshelves making room for more people to be seen as part of the shared mediated space.[128] As previously described, employees were involved in a yearlong participatory design process which was based on a series of workshops, group collaborations,

[127] For a detailed account of the different phases of the project, see Räsänen 2006; 2007; Räsänen et al. 2005; Gullström et al. 2003.

[128] Räsänen notes that these changes strengthened the sense of community between the groups of office-workers, and notes how staff in the remote workplace exclaimed: "This is how it should be. Now one has co-workers." (Räsänen 2007: 157)

and individual tasks.[129] The work was organized and led by an interdisciplinary research group which brought together people with many different skills: social anthropologists, social scientists, interaction designers, media technology engineers, and me, an architect. In the photo below I demonstrate a simple model to show what the colleagues on other islands would see of each workplace, once it was extended. As in the previous project, it was difficult for many to visualize how a mediated workplace would change work activities. Others, however, found the process lengthy and were to an extent disappointed once the design prototypes were installed.

95. Here, I demonstrate a simple model to discuss what the colleagues on the other islands would see of the workplace, once it was extended.

Räsänen, a member of the project group with a background in social anthropology, observed the establishment of a sense of affinity that developed in the design process. In her doctoral thesis, 'Islands of Togetherness' (2007), she notes that some staff members felt increasingly burdened by the potential technical intrusion upon their workplace. This concern had an effect on their later interest to participate in remote interaction after the meeting bar was installed. Nevertheless, Räsänen demonstrates that remote affinity was established between the three workplaces (ibid.: 150ff), although this feeling was not always explicitly expressed by staff members themselves. Räsänen stressed the significance of seeing and hearing each other for a sufficiently long period of time as a contributing factor in the development of mutual affinity. The sense of similarity and of belonging to the same organization evolved during everyday practices characterized by

> …fragments of talk and other everyday sounds carried across the communication environment. Once we heard distant laughter from the other site, Lisa happened to walk by and said smiling, 'Oh, they are like us.' Lisa referred to the laughter that was also part of everyday life at her site as well. (ibid.: 159)

The 'togetherness' that Räsänen recorded is in many ways related to the concept of trust and its relationship to (witnessed) mediated presence, as elaborated by Nevejan (2007). In the following chapter, I will look more closely into one design feature that is crucial to this development, which all three design examples mentioned so far have illustrated: mutual gaze.

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[129] I refer to the doctoral theses of two other project members. For a thorough description of the participatory design process, see Westerlund 2009; Räsänen 2007.

chapter 4 sharing knowledge sharing spaces

4

96. A time clock in use at a Swedish industrial workplace. ('Stämpelklocka. Motala Verkstad.' 1969. Photographer: Jean Hermanson)

The time clock.

The time clock is a well-known representation of presence in the workplace. As an artefact, it embodies a paradigm in which the workers' presence at the workplace is required, or even taken for granted: a commitment and contribution which includes one's physical presence in a defined location for forty hours a week or so. Although still in use in some places, the time clock has mostly been replaced by more subtle means of controlling of time and space; we may perhaps speak of 'trust'. In a short period of time the concept of work has acquired new meaning, thus new models of work engender a concept of presence which separates body and mind: an employee may physically be located far from the office, yet can still deliver his/her contributions remotely. Nevertheless, if we take a look around the workplace, many artefacts still remain as reminders of old times. Time may pass by swiftly, but spatial design and architecture often preserve a paradigm that would otherwise slowly become obsolete. Such is the case with the presence-in-person paradigm, embodied by the time clock, which is observed in this chapter.

INTRODUCTION

The previous chapter touched on the history and theory of presence design, and included an account of the first mediated workplace, designed at Xerox PARC more than thirty years ago. It is often debated why, since the technology to enable remote presence already exists, the change in work patterns has been so limited. At the intersection of architecture and media technology, mediated spaces enable spatial extensions and dialogic interaction between groups or individuals without relocating staff or transporting building materials. Considering the negative impact that travel has on the environment, it is questioned why office-workers do not replace frequent journeys more often with mediated meetings.[130]

The overall purpose of this chapter is to address some of the underlying expectations of collaborative work practices, which concern knowledge sharing, communication and interaction, while focusing on the relationship between presence design and architectural design. By showing that presence design, in effect, can be viewed as an extension of architectural design, I argue that similar mechanisms are at play in both practices. That human behaviour and interaction are reinforced by design is general knowledge, but how the convention of workplace design (to which both users and practitioners subscribe) relates to the concept of presence has been little explored. In the course of the chapter, I introduce the reader to how these mechanisms operate, in order to show that we cannot expect a change in human behaviour unless we also address the world of artificial artefacts (which includes spatial design), which, according to Simon, steer human behaviour (1969). To introduce a new technology that facilitates the high-quality dialogic interaction expected from collaborative work practices is, simply put, not enough. Spatial elements also play a crucial part.

A second purpose of this chapter is to point at specific conceptual tools – derived from my own practice as well as from related visual practices and presented in Chapter 3 – which may be of particular interest to presence design, as a relatively new practice that so far lacks in aesthetic concepts. Throughout the second half of the chapter, I test these concepts by applying them to a selection of presence design examples. While some of these concepts are borrowed from architectural design, others specifically derive from knowledge management practices that have identified factors that may inhibit knowledge sharing and dialogic interaction. I refer to these spatial design considerations as 'design frictions', since they have the potential to negatively impact the experience of mediated presence. In addition to what is usually expected from workplace design, these design concepts must also be addressed and thus be added to the conceptual toolbox of practitioners in the field.

In summary, the double nature of this chapter, 'Sharing Knowledge Sharing Spaces', reflects the relationship between the two practices it wishes to address, and the complexities within each of these. On the one hand, the focus is architectural design that specifically supports knowledge sharing, communication and interaction (Sharing Knowledge). On the other hand, it addresses presence design strategies that enable high-quality forms of interaction while individuals remain in different locations (Sharing Spaces). My sequence of design examples is presented at the end of the chapter, followed by theoretical reflections in subsequent chapters.

Together, Chapters 4 through 7 constitute an account of the dual nature of my design-led practice and research. My experiences from practice (as architectural designer as well as presence designer) have triggered reflections that I have subsequently explored theoretically. Because these four chapters are closely linked, this chapter serves to introduce them all.

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[130] The Norwegian Ministry of Government Administration Reform and Church Affairs reports that if work-related travel within the EU were reduced by 20%, e.g. by replacing one of five trips with video meetings, there would be an estimated annual decrease of 22 million tonnes climate gas emissions (Econ Pöyry 2009). Economic and organisational barriers to such a reduction are frequently cited (e.g. Arnfalk 2002; Henriksson & Räsänen 2010). In comparison, the Swedish Institute for Transport and Communication analysis reports that during an average month in 2005-2006, only 2% of workers had participated in a videoconference (SIKA 2007).

Sharing Knowledge

Chapter 4 is based on my experience as a practicing architect. Between 1990 and 2005, I led a renowned architectural practice in Stockholm, which specialized in the design of spaces in which learning, collaboration and communication were central and explicit concerns. My clientele included many leading Swedish corporations and educational institutions.[131]

In turn, Chapters 5 through 7 are based on my subsequent experience as a presence designer, from 1999 to 2009, and discusses the design examples which were introduced earlier: *A Mediated Therapist*, *Mediated Unemployment Services*, *Remote Affinity in the Archipelago* and *The Mediated Museum*. While the first three relate to the topic of workplace design, i.e. what architects contribute to support collaborative practices, I use the latter five to directly address the concept of spatial extension and shared mediated space. In all, the examples serve to illustrate different design concepts available to presence designers.

While it is noteworthy that many important design criteria were considered in the first mediated workplaces thirty years ago at Xerox PARC – the need for mutual gaze, life size representations, and integration with spatial design – the concepts of working and meeting were quite different at the time, and have since acquired significantly different meaning.

I show that for a long time, workplace design has been modelled on a *presence-in-person* paradigm that gives the individual few possibilities to change the pattern of behaviour imposed by commuting, travel, and a normative layout of the office. To observe this development, I provide a brief account of the history of workplace design, which also contextualizes my own experience as an architectural designer. With reference to scholars in knowledge management and space syntax theory, I identify a number of design frictions that may inhibit knowledge sharing in work and learning environments.

In recent years, a paradigm shift in terms of work has been underway, and I address the opportunity to reform workplace design and discourse, in support of emerging collaborative work practices, where knowledge sharing is a crucial concern. I compare the Xerox PARC *Media Space* with examples of workplace design in the 1990s, which similarly attempted to facilitate knowledge sharing, communication and interaction. Aiming to address the potential effect of presence design on workplace design, I discuss two possible scenarios: the *no-presence* and *co-presence* scenarios.

Sharing Spaces

Throughout Chapters 4 to 7, I describe projects to which I have contributed, and analyze the work of others, in an attempt to show that presence design is an extension of architectural practice and discourse.

Among the concepts I raise throughout these chapters, some can be regarded as more significant than others, especially in terms of the frictions that relate to knowledge sharing. For example, I discuss the role that gaze and mutual gaze play in dialogic interaction (Chapter 5), which is closely related to the establishment of trust. Furthermore, I point at the different forms of collaboration, e.g. formal versus informal, lateral versus peripheral, and discuss how each are supported in spatial design. Here I refer to the designs examples *A Mediated Therapist*, *Mediated Unemployment Services*, and *Remote Affinity in the Archipelago*.

What are mediated spaces, really? What concepts from architectural discourse are applicable in an analysis of such spatial relationships (as when 'spaces meet')? In my discussion so far, I have referred to mediated spaces as spatial extensions, means by which one space is enlarged by reaching into another space. What constitutes a border between different spaces, or between interior and exterior spaces, is indeed a central theme in architecture. By examining the origins of architectural elements such as windows, I discuss similarities and differences to mediated windows, walls and spaces in Chapter 6. Using the concepts of framing and transparency, I explore how windows have been treated in the modern history of architecture, by the likes of Le Corbusier, Mies van der Rohe and Bruno

[131] See Appendix 2 for details.

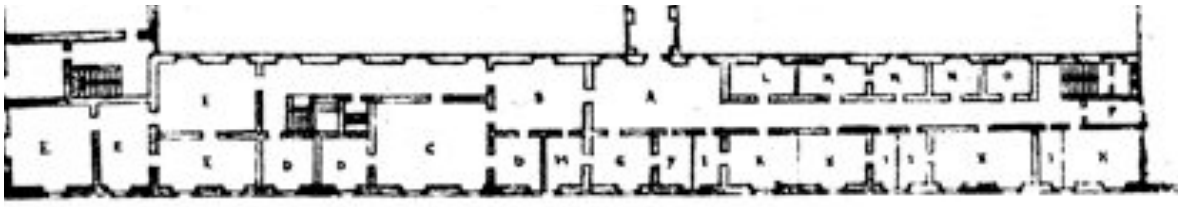
Taut. This, in turn, allows me to contextualise the example of the *Mediated Museum*. I give a brief account of the history of glazing and discuss whether the different ways of representing the passage from indoors to outdoors in art and architecture are fully taken into account in the design of mediated spaces.

After the discussion of framing and transparency, I introduce the concepts of 'shared mediated space' and 'offscreen space' to specifically address the different design strategies at hand in presence design. I discuss these design strategies in more detail in Chapter 7, under the label 'spatial montage' and 'tertium quid' with reference to Eisenstein. Of further interest is how an 'active spectatorship' can be sustained in presence design, a concept to which I referred in Chapter 3, with reference to film and museum practices. I then return to the example *Atwood in Norway* and analyze a mediated music masterclass, as well as two mediated academic dissertations, to illustrate the range of design strategies which are currently available to presence designers.

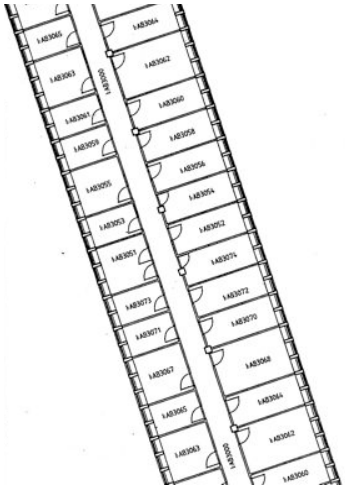
OFFICE ORIGINS AND THE PRESENCE-IN-PERSON PARADIGM

> [An] idea is a *live event*, played out at the point of dialogic meeting between two or several consciousnesses.
> (Bakhtin 1984 : 88)
>
> Architecture mortalizes and glorifies something.
> Hence there can be no architecture where there is nothing to glorify.
> (Wittgenstein 1977: 69)
>
> When I obey a rule, I do not choose.
> I obey the rule *blindly*.
> (Wittgenstein 1953: §219)

Until very recently, expressions such as 'I'm at work', or 'Let's book a meeting', would by necessity imply the action of going to the office and to sit down at one's desk; or travelling somewhere in order to physically meet in a conference room to discuss something with someone. In fact, the office as we have known it since the sixteenth century does exactly this: it provides spatial and technical support for individuals who are gathered in one location in order to produce work, sometimes through collaboration, but mostly in solitude. The development of the office building emerged from the demands of administrating the sixteenth-century European feudal society, for which clerks and scriveners were needed to register taxes and goods. An early example of the cellular office layout, which still prevails, is the Palazzo degli Uffizi, in Florence (ca. 1560), designed by Giorgio Vasari as an annex to the Palazzo Vecchio. Its Swedish equivalent was the central administration of King Gustav Vasa, who allocated a tax office for about thirty office workers, mentioned in a document as early as 1543 (Swedlund et al. 1969: 17).



97. Swedish architecture historian Fredrik Bedoire (1979: 17) relates the Swedish origins of the cellular office layout to King Gustaf II Adolf's administration in 1658. The layout above shows an office wing with small offices on either side of a corridor, which also contained small meeting rooms and a larger conference room. Later designs were modelled on this particular spatial layout, for example, the new Royal Palace (1762) as well as 'Kammarrätten', which was the first building dedicated to state administration in Stockholm (1804).



98. A contemporary cellular office: Ericsson Mobile Systems, Stockholm 1994. (Drawing in Gullström & Westerberg 1998)

However, considering recent developments triggered by the process of digital dematerialisation, it is safe to suggest that a paradigm shift has taken place in a very short space of time.[132] Just fifteen or twenty years ago, the office was, in practical terms, the only place where one could perform one's work tasks. Computers and telephones were attached to sockets in specific locations, and neither computer networks nor the Internet were adequately in place to enable an individual to move work from one location to another, even inside the office.

99. Typical open plan workplaces. Photos taken in Stockholm in the early 1990s.

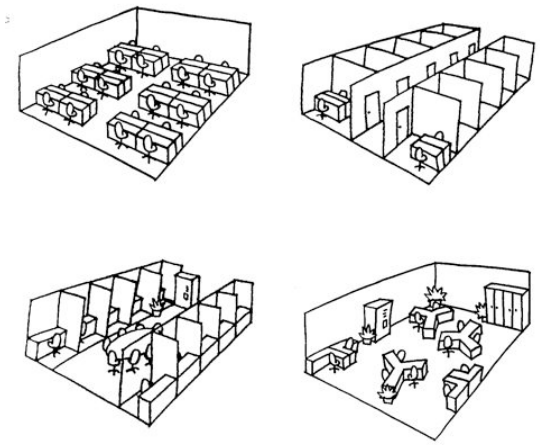
Not only have work patterns changed, so have the philosophy and the culture of organisations and workplaces (Becker 2004). Mobility of data, in the early 1990s, was still restricted to the movement of floppy discs – precursors to USB memory sticks – which made it possible to temporarily move documents from a computer in the office to another elsewhere. However, one could always expect that a colleague who had left would reappear at the office soon again. *Presence in person* could be taken for granted; it was the norm.

The concepts of working and meeting have since acquired new meanings, in the sense that we no longer take it for granted that a person will undertake a trip or commute to attend a work-related meeting. Most office workers today are engaged in many parallel processes and will decide to travel only after weighing the importance of human interaction against the urgency of their other commitments. People will consider context, time, cost, or environmental reasons, perhaps by thinking, 'Can we possibly do this over the phone? Do I really have to be there? For how long? Are conferencing facilities available?' Without suggesting that human presence has lost its importance in today's work-life, one could

[132] See e.g. Castells 2000; Castells et al. 2007; Tuner & Myerson 1999; Donald 2001; Koprowski 2000.

perhaps say that we have now entered a phase where presence is negotiated. It is significant to note that in spite of different presence technologies – which enable office workers to participate remotely and to meet, produce and deliver work from mediated spaces away from the office – surprisingly few changes in terms of office design have been seen.

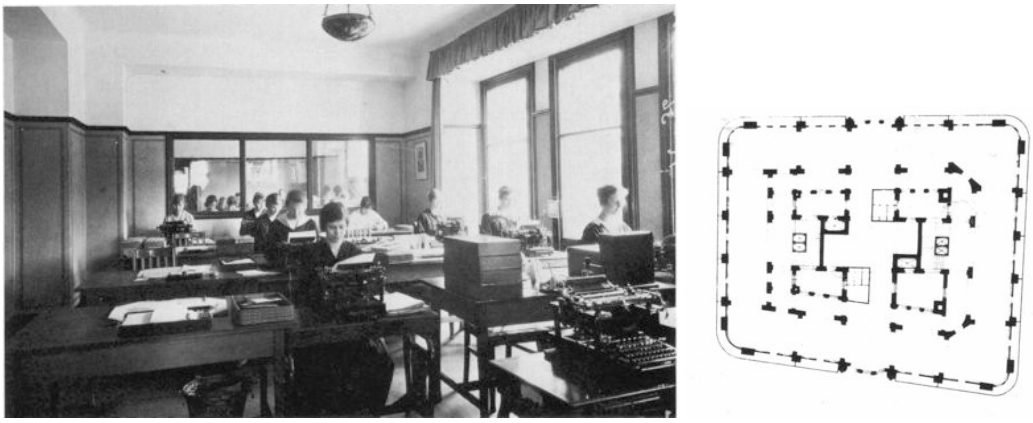
Although many different configurations exist, the spatial strategies of the office are still limited, and most can be traced back to the basic and distinct typologies of the *cellular* and the *open plan* office *(*also known as the *bull pen)*. The main difference between these two strategies is that individuals in the former are partitioned off from each other by walls in order to ensure distinct audiovisual separation.[133] The spatial strategies are illustrated below.



100. Varieties of office types in Europe, which all arguably support the presence-in-person paradigm. Clockwise from top left: open plan; cellular, landscape, and combi-office. Human interaction and collaboration is expected to take place in designated 'meeting' areas and 'conference' rooms. (Illustration from van Mehl 2000: 17)

101. Examples of bull pen offices, in which workers perform individual work, yet share a space collectively, primarily for practical reasons. In the early days of industrial development, workplace design bears no particular distinguishing features; salons of residential buildings were furnished and used as offices for as many workers as possible.

[133] The open plan office was made possible by steel-frame construction. Its benefits include easily changed partitions in response to tenants' needs, easy communication between workers and better distribution of light and ventilation (Sundstrom 1986; Pile 1978).



102. Between 1880-1900, following the increased use of telephones, typewriters, mechanical counting devices, etc., private initiatives resulted in dedicated office buildings. An architecture marked by new materials, such as the use of steel-frame construction, emerged (Duffy 1997). These structures enabled large, open interiors where workers were commonly supervised from the manager's glazed workspace in the background, as shown above, in what has been referred to as the first Swedish example of a modern office building: the Central Palace, 1920, modelled on the so-called Chicago School. (Bedoire 1979)

103. Other bull pen examples from a phase which introduced what the architectural historian Fredrik Bedoire has labelled 'the mechanization and proletarization of office work', soon to be reinforced by the separation of routine work and quality work of Taylorism, which is in many ways ongoing (1979). To the left, the Swedish insurance company Trygg (1910). To the right, Frank Lloyd Wright's renowned architecture for a large mail-order company with a large number of office workers: The Larkin Building, in Buffalo, New York, US (1904). Its main characteristic is an open central interior. While providing efficient ventilation and lighting, it also enabled effective supervision by management. Each parallel row of desks seated six office workers in a way that facilitated the circulation of paper, whilst limiting human circulation. The Larkin building embodies the principles of scientific management and bureaucracy. (Duffy 1997; Donald 2001)

THE ROLE OF PRESENCE FOR KNOWLEDGE SHARING AND DIALOGIC INTERACTION

In their analysis of human interaction behaviour in the early mediated spaces of Xerox EuroPARC, Christian Heath, Paul Luff, and Abigail Sellen[134] discussed the limitations of mediated spaces that primarily provided a 'face-to-face, head and shoulders view', stressing that "face-to-face interaction constitutes a relatively small part of working together, and is one amongst a diverse configuration of spatial and bodily arrangements through which personnel participate in each other's activities and accomplish the 'business at hand'" (Heath et al. 1995: 177). One conclusion of the *Media Space* project is that "video technology which primarily provides a face-to-face orientation to users, fails to support peripheral monitoring and peripheral participation, does not provide access to tools, artefacts and the users' local environment, and introduces unanticipated asymmetries into the interaction between users, is unlikely to support even the most basic forms of organisational work" (ibid.).

Based on their prior research on organisational group behaviour, Heath et al. stress that collaborative workplaces in general reveal generic features which are also relevant to mediated environments. In a collaborative setting, co-workers develop "a body of informal and tacit practices for distributing information to each other and coordinating simultaneously multiple activities. These practices allow personnel to distribute information to colleagues and to monitor each other's activities whilst apparently engaged in a single, individual task." (ibid.: 176)

In effect, what they stress is that face-to-face interaction is only one amongst a variety of cooperative activities which take place in a mediated work environment. They state that "much collaboration is undertaken side by side where the individuals are continuously sustaining a shared focus on an aspect of a screen or paper-based document, such as a section of an architectural drawing" (ibid.). Heath et al. mention the following aspects of collaborative work as significant to mediated interaction:

(1) Focused and unfocused collaboration largely occurs through alignment towards the focal area of activity, such as a document, where individuals coordinate their actions through 'peripheral monitoring';

(2) Collaborative work is dependent on individuals and their subtle and continuous adjustment to each others' activities;

(3) Collaborative work involves ongoing and seamless transitions between individual and collaborative tasks, where staff simultaneously participate in multiple interrelated activities;

(3) An individual's ability to contribute to the activities of others and fulfil their own responsibilities relies upon *peripheral awareness and monitoring*: "in this way information can be gleaned from the concurrent activities of others within the 'local milieu', and actions and activities can be implicitly coordinated with the emergent task of others";

(4) In co-present working environments, the interaction through which individuals produce, interpret and coordinate actions is accomplished using various objects and artefacts (paper, computers, etc.). Teamwork is rendered visible through these objects and artefacts. (ibid.: 177)

[134] In 1995, Heath was affiliated with the Department of Sociology, Kings College, London and Luff to the Department of Sociology, University of Surrey, Guildford. Sellen was affiliated to the Applied Psychology Unit, Cambridge as well as to the RANK Xerox EuroParc, Cambridge UK.

These aspects are useful in that they point to activities in relation to their physical or mediated surroundings. While it is perhaps obvious that such collaborative work primarily takes place outside allocated meeting rooms, i.e. in the actual workplace, it is noteworthy that in terms of the research and development of mediated spaces, there has been an emphasis on face-to-face interaction and supporting formal meetings by means of 'video-conferencing'. Heath et al.'s discussion therefore provides an important point of departure for my own study and serves as the cornerstone of the design work that my colleagues and I have undertaken to support informal and collaborative mediated interaction. Heath et al. conclude:

> Perhaps the most important element of this interactional work, is the ways in which individuals monitor each other's involvement in, or alignment to, an object or artefact. It is not a case of seeing what another is seeing, but rather seeing the other in relation to what he or she is looking at and doing. (1995: 178)[135]

These observations regarding mediated interaction can be related to the concept of dialogism that Mikhail Bakhtin (1984) puts forward as a basic principle on which all essential human interaction is based.[136] For Bakhtin, ideas develop through dialogic relationships with language as a tool. The meaning of *dialogic* is made explicit in the following passage, in which Bakhtin refers to Dostoevsky's poetics:

> The idea begins to live, that is, to take shape, to develop, to find and renew its verbal expression, to give birth to new ideas, only when it enters into genuine dialogic relationships with other ideas, with the ideas of *others*. Human thought becomes genuine thought, that is, an idea, only on conditions of living contact with another and alien thought, a thought embodied in someone else's voice, that is, in someone else's consciousness expressed in discourse. (Bakhtin 1984: 88)

When organisations rely on collaborative work practices, as many do, the underlying assumption is that interpersonal communication and interaction (i.e. human presence) can be linked to knowledge sharing and effective workgroup performance. In consequence, it might also be assumed that a certain spatial layout, e.g. the open plan office, may facilitate such exchange. As many have already shown, these assumptions are grounded in complex epistemological processes that are not directly related to spatial design, but this discussion nevertheless serves to illuminate the presence-in-person paradigm I presented previously. Even if it has proven difficult to establish a causal link between spatial layout and workgroup performance (Sailer & Penn 2009; Sailer 2010; Steen 2010) or knowledge sharing, it may still be an assumption that prevails in workplace design. Practitioners and organizations may use a specific layout, for example 'open plan', in the interest of promoting interaction, collaboration, and knowledge sharing. It is therefore important to observe which role presence plays in knowledge-sharing practices.

My primary aim is to establish whether human presence really is a prerequisite for knowledge sharing in work contexts, or whether mediated presence may also be regarded a viable alternative. If knowledge sharing is facilitated by mediated presence, the implications for workplace design can be discussed accordingly. To explore these complex issues, I must clarify the concept of organizational knowledge and further address the underlying expectations of presence and interaction in work contexts.

In his seminal book *Personal Knowledge,* Michael Polanyi presented his notion of a tacit dimension of knowledge (1958; 1962). This was followed by *Knowing and Being* (1964; 1969) and *The Tacit Dimension* (1966; 1983). By discussing 'knowing' as the outcome of a learning

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[135] At EuroPARC such observations led to a series of user studies conducted by using multi cameras, and a variety of displays, some of which provided a bird's-eye view of the spaces (Heath et al. 1995: 178ff).

[136] Bakhtin considered the opposite of *dialogism* to be *monologism*. He writes: "In the monologic world, *tertium non datur*: a thought is either affirmed or repudiated: otherwise it simply ceases to be a fully valid thought." (1984: 80)

process, often characterized as 'learning by doing', he addresses the notion that a tacit dimension cannot fully be articulated in words or images. For Polanyi, all kinds of knowledge contain implicit and explicit dimensions that are interwoven and coexist: "all knowledge is either tacit or rooted in tacit knowledge. A wholly explicit knowledge is unthinkable." (1969: 144) His work has spurred a more recent interest in collaborative work practices where 'human presence' in close and informal interaction enables the sharing of the tacit dimension of knowledge beyond the mere 'transmission of information' (Collins 2001).

Polanyi's concept of tacit knowing has been applied to a variety of practices, and researchers from many disciplines have shown that knowledge sharing is fostered through personal communication, interaction and the development of trust over an extended period of time, which is likely to occur, for example, in a master-apprentice relationship.[137] With time, a form of knowledge that consists both of habits and skill may evolve within a professional culture, which is shared among the members of a practice.

The above was reflected in my own study, written in the early 1990s, on the role that tacit knowledge sharing played within architectural discourse, as it was transmitted between generations of architects in early-twentieth-century Stockholm (Gullström 1994).[138] I observed the close work and learning relationships that evolved within a group of architects as they combined the roles of leading practitioners and professors. It is important to note that while a master-apprentice relationship facilitates knowledge sharing (notably its tacit dimension), it also conserves and preserves other values embedded in practice, some of which would otherwise have disappeared as other societal developments took place. Thus, professional skill may be acquired and a professional identity strengthened while this conservative role produces a resistance to change. [139] In the extreme, a professional discourse may be 'out of step' with other developments in society, such as suggested earlier in terms of the current era of digitalisation and its limited impact on work practices. My argument that the presence-in-person paradigm in workplace design is partly maintained by professional discourse may be seen in this light.

To discuss whether presence may be regarded a prerequisite for knowledge sharing in work contexts we must first clarify the concept of organizational knowledge. Davenport and Prusak's definition of knowledge, like many others, stresses that knowledge is essentially related to human action.[140]

> Knowledge is a flux mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organizations, it of-

[137] First applied by scientists within the SSK-tradition (Sociology of Scientific Knowledge), Kuhn's pioneering work, *The Structure of Scientific Revolutions* (1962), was followed by Collins (1974). Scientific work has since developed in e.g. the areas of knowledge production, management, and innovation (e.g. Nonaka 1994); and in 'evolutionary economics' (e.g. Nelson & Winter 1982). As already mentioned, a Swedish focus on professional skill emerged from a social science perspective, with a critical perspective on the effects of computerization in work-life contexts, and which led to the formation of the Skill & Technology research area (Göranzon et al. 2006; Göranzon & Josephson 1988; Göranzon 1992).

[138] As previously mentioned, my thesis for an intermediate doctoral degree (Technical Licentiate), 'The Paradox of Mastery' (Gullström 1994), was written under the guidance of the Skill and Technology programme at the Royal Institute of Technology in Stockholm 1990-94, headed by Göranzon.

[139] My study observed the professionalization process of the architect in Sweden, which, as elsewhere, is characterized by master-apprentice relationships. I identified the conflicting ideals between what remained of a 'Beaux Arts tradition' and what was introduced as a 'polytechnical ideal' in late-nineteenth-century institutions, noting such a resistance to change.

[140] Cf. Nonaka & Takeuchi 1995: 58ff. Similarly, Weggeman's model of knowledge sharing (1997) builds on Shannon and Weaver's communication model (1949), by providing a context of circular activity between existing knowledge and actions undertaken which lead to the production of new data. Drawing on philosopher John Dewey's concept of *aesthetic experience* (1934), Bell's definition of knowledge stresses the link between action and judgement: "judgement arises from the self-conscious use of the prefix re: the desire to *re*-order, to *re*-arrange, to *re*-design what one knows and thus create new angles of vision or new knowledge for scientific or aesthetic purposes" (Bell 1999: 9).

> ten becomes embedded not only in documents or repositories but also in organizational routines, processes, and norms. (1998: 5)[141]

This broad definition encompasses a widely accepted distinction between explicit knowledge (information, data) and tacit knowing (experiences, skills, values) in accordance with Polanyi's theory.[142] It also allows us to relate Wittgenstein's concept of rule-following to the context of organizational knowledge. While Polanyi has shown that knowing is personal, rule-following is not an individual accomplishment, but instead fundamentally based on collectively shared meanings (Wittgenstein 1958).[143] While some aspects of organizational knowledge are formal and explicit, these are put into action and given meaning by an organisation's members, such as office workers. Such a Wittgensteinian view is formulated by Barnes (1995: 202), who states that members "must be constituted as a collective able to sustain a shared sense of what rules imply and hence an agreement in their practice when they follow rules." Much of this 'shared sense' is embedded and implicit in workplace design. Architecture and design, in effect, provide a means to represent a certain form of rule-following, which is why an architect will attempt to understand both explicit and formal aspects of organizational knowledge, as well as its underlying and implicit aspects.

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[141] Cf. the concept of distributed knowledge (Langlois 2003).

[142] There is, however, an on-going scientific 'codification debate' regarding to what extent tacit knowing can be made explicit, codified and transferred using certain media; see e.g. Balconi et al. 2007; Cowan et al. 2000; Johnson et al. 2002.

[143] See e.g. Wittgenstein 1953: §202: "And hence also 'obeying a rule' is a practice. And to *think* one is obeying a rule is not to obey a rule. Hence it is not possible to obey a rule 'privately': otherwise thinking one was obeying a rule would be the same as obeying it."

FRICTIONS

The aim of knowledge sharing (or knowledge transfer, as Davenport and Prusak call it) is to improve an organisation's performance, to increase its value. Knowledge sharing involves the action of transmission (sending or presenting knowledge to a recipient) and absorption by the latter. Unless absorbed and connected to some change in behaviour, knowledge has not been transmitted (Davenport & Prusak 1998: 101). So far, nothing suggests that human presence is requisite to knowledge sharing, but Davenport and Prusak coined the term 'frictions' to point at a number of cultural factors which may inhibit knowledge sharing (ibid.: 96). Amongst these, lack of trust, lack of common ground (cultural, hierarchical), lack of time, and lack of meeting place are noteworthy aspects in terms of the spatial issues discussed here. Fairly similar results are noted in other disciplines, such as in space syntax theory where it is expressed in more spatial terms that proximity, visibility and layout stimulate interaction.[144] In cognitive science, similar terms are used to discuss factors that contribute to poor synchronizing in human interaction (Argyle & Cook 1976), such as when the subtleties of nonverbal communication are lost (Heath & Luff 1991; Rutter et al. 1984). One such feature is eye contact, which is used as a control mechanism in social behaviour, for example, to signal intimacy. Hence mutual gaze is important to the establishment of trust, both in real space as well as in mediated interaction (Heath & Luff 1992; Heath et al. 1995; Rocco 1998; Acker & Levitt 1987; Ishii & Kobayashi 1992; Fullwood 2006). Trust is an important prerequisite to the individual experience of presence in mediated environments, and serves to establish a 'sense of being there' (IJsellsteijn & Riva 2003; Lombard & Ditton 1997; Held & Durlach 1992).

While the benefits of information technology in facilitating the transmission of data and explicit knowledge were already quite obvious, we have now identified several aspects which can be related to spatial design, and which matter in terms of tacit knowledge sharing. As noted earlier, the relationship between knowledge sharing, human presence and workplace layout is complex and our aim here has not been to make conclusions, but rather to discuss the expectations of collaborative work practices, and more importantly, whether other means of supporting knowledge sharing in future workplace contexts – for example, remote presence – can be considered as viable solutions. What, in consequence, would be required from workplace design, were organisations to place the same expectations on knowledge sharing in mediated environments? We can use the 'frictions' proposed above to discuss whether mediated workplaces support knowledge sharing as adequately as real workplaces. In the following, we will look at recent examples of mediated workplace design to ascertain/discuss whether mediated spaces add to the 'friction' in the development of trust, common ground, time and meeting places. Will remote presence, as enabled by the design prototypes, in effect, reduce the frictions? If so, what is the potential for future workplace design within the emerging paradigm of remote presence? We will later return to the topic of collaborative work practices, and look at attempts within conventional workplace design to support teamwork: the original vision of the Bürolandschaft, the combi-office and flex-office teamspace designs.

Created through the combination of architecture and media technology, mediated spaces create spatial extensions and enable collaborative work practices while eliminating the need to relocate staff or transport building materials. In arguing that these new design practices

[144] See e.g. Hillier 1996. Allen (1977) showed that the effect of co-presence has certain spatial limits. Nonaka and Konno (1998) stated that tacit knowledge can only be shared through joint activities, whilst spending time or living in the same environment. Providing a content analysis of sixteen major literary sources in workplace research (1992-2006), Rianne Appel-Meulenbroek stresses that concepts such as *cooperation* and *interaction* are preferred to *knowledge sharing* (Appel-Meulenbroek 2009). She has assessed the terms most often used to denote *co-presence* (visual/aural accessibility, proximity, meeting areas) as well as *movement* (layout of the floor, location within the building) in accordance with spatial behaviours, which Rashid et al. (2006) mention in connection to face-to-face interaction.

can foster sustainable patterns of behaviour, it must be acknowledged that mediated spaces were already introduced to workplace design more than twenty years ago.[145] As suggested by the comparison here (between early media space designs and more recent attempts to audiovisually extend interior design), many of the distinguishing design features of mediated spaces were considered early on, such as the need for mutual gaze, life size representations and integration with spatial design. It is noteworthy, first, that today's designers still struggle with similar challenges; and second, that in spite of early attempts, there have been few applications which followed from the early research in this field. One possible explanation is that workplace design modelled on the presence-in-person paradigm yielded few possibilities to change the pattern of behaviour imposed by commuting, travel, and the normative layout of the office. I am arguing that the concepts of working and meeting have recently acquired new meaning, and that a paradigm shift in terms of work has taken place. This change has provided architects with an opportunity to reform workplace design so that mediated spaces and presence design can support interaction across time and space.

The accounts from staff at Xerox PARC's mediated workplaces in Oregon and Palo Alto in the mid-1980s bear proof of close collaboration between management, lab personnel and researchers that mediated spaces facilitated. In an organisation where most decisions were made by consensus, mediated, sometimes weekly, cross-site lab meetings ensured research progress, but also prompted social activity and exchange. Among the conclusions of their research is that close collaboration is enhanced by a sense of "a day-to-day sense of community and a regular awareness of one another's activities" (Bly et al. 1993: 41). Furthermore, mediated spaces gave Xerox staff the sense that "We could be close to our colleagues who were, in fact, quite far away." (ibid.: 45) For an individual to maintain a sense of the group, it was deemed essential to maintain a sense of the members' connections to one another: "Like walking into a room in which a meeting is about to begin, it is important to see who is talking to whom, who is listening in, and who is available." (ibid.: 44) This first mediated workplace is described as a *sustainer* of close working relationships within a community, one that was partly modelled on the informal teamwork of an architectural design studio, and to which several architects contributed.[146] The motivation behind the mediated workplace has been described as the aim "to 'fix' PARC's beautiful, personal, but isolating offices: designers wanted to be able to work together without having to get up and hike to other offices" (Austin Henderson in Harrison 2009: 206). In effect, the design was an attempt to transform a cellular office into a shared open space: "I was working with Anette Adler whose office was remote from mine in the building (…). We coupled our offices by directly connecting a camera in each of our offices (…). We came to think of ourselves as working in a single room having two doors onto two different hallways." (ibid.: 207) As illustrated by the pictures below, the prototypes were never integrated in the environment, and among their conclusions, PARC researchers reflect that "the way we work shapes the design and the media space shapes the way we work". They describe this *iterative molding* of activity and technology through design as "critical in allowing a media space to become the setting for work and not the locus of its own peculiar activity. This is also the key to developing technology that ultimately 'disappears' so that the life of the workplace is simply carried on through it." (Bly et al 1993: 44) In terms of the frictions discussed in the earlier section, this suggests that the integration of technology and spatial design is critical for work-life 'to carry on'. Another feature is the need for eye contact, which was not part of this

[145] As previously noted, architects and researchers employed at Xerox PARC's branch offices in Palo Alto and Oregon experimented with 'media space' workplace designs from 1985 onwards. For a detailed description, see e.g. Bly et al. 1993; Stults 1986; Harrison 2009.

[146] A sub-project, the *Office Design Project*, set out in 1986 to support collaboration between three architects in different locations. They met asynchronously using video recordings to document the development of sketch work and threaded conversations. See: Harrison 2009; Weber & Minneman 1987.

design process (ibid.: 34).[147] In the case of mediated spaces, this adds two new 'frictions' to the list of design features that may inhibit interaction and knowledge sharing. The other frictions, identified by Davenport and Prusak (1998), were explicitly addressed in the studies referred to here. Researchers used examples in their design-led research to meet the same challenges mentioned earlier, namely to facilitate trust, common ground, time and meeting places (Bly et al. 1993, Harrison 2009).

104.Mediated interaction at Xerox PARC in 1985, the occasion where the possibility of "configuring equipment to provide direct eye gaze" is discussed (Bly et al. 1993: 34). The original caption: " A. In Portland, Bob, Tim and Beth are talking about their recent vacation. B. As they continue their discussion, Sam sees and hears them as he walks through the Palo Alto Commons. C. Sam walks up to the link, and Bob sees him and says hello. D. The group involves Sam in the remainder of the vacation story. Sam and Tim then proceed to have a lengthy technical discussion." (ibid.: 36f)

In spite of the many advances within media and communications that have taken place since 1985, there are still few examples where presence technologies are convincingly integrated with spatial design. When they are, they are exclusive systems dedicated to specific conferencing facilities, rooms to which workers specifically go for a meeting limited in time and space.[148] While most systems are well designed in terms of user interface, and support an extension of one room to another as well as represent the participants in their natural size, only some adequately enable mutual gaze, a feature widely accepted as a key element in presence design. Several attempts to design mediated workplaces specifically to support teamwork outside the meeting room have also been made (see e.g. Binder et al. 2004; Ehn et al. 2007; Harrison 2009, for an overview) as well as numerous examples from, for example, interaction design to support collaboration per se, which do not necessarily rely on synchronous transmission and video communications.[149]

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[147] Participating psychologists also asserted that "the resources upon which a speaker ordinarily relies to shape the ways in which a co-participant listens and attends to the talk appear to be interfered with by the technology" (Heath et al., 1995: 174; cf. Heath & Luff 1992).

[148] See e.g. Tandberg *T3* telepresence solution, praised in media for its integrated design to which social anthropologists have contributed (Tandberg 2009). Product manager Anders Mortvedt expresses that "The design of the room was just as important as the technology. We started with the challenge of the human factors – the barriers that have to be overcome to make people believe that they are sitting in the same room when some are potentially thousands of miles away." See also other products by e.g. Cisco, Tandberg and Polycom for market leading videoconferencing solutions as well as more experimental ventures to implement 3D, recently by Radvision and partners supported by EU funding (3D Presence 2009).

[149] The Internet-based platform for collaboration, *Second Life*, provides one example where individuals, represented by avatars, interact in virtual space (Second Life 2010). Similarly, commercial solutions offer an

CO-PRESENCE OR NO-PRESENCE: TWO SCENARIOS

It has been argued here that the prevailing spatial strategies in office design favour individual work over collaboration. They are, I argue, remnants of the presence-in-person paradigm. It must be stressed, of course, that the numerous activities that take place inside an office cannot be categorized as either individual or collaborative. Most often it is a combination of the two that will define an organization's need for spatial support. In effect, the notion of office work varies greatly across organizations and it has been a concern within the field of space syntax research to understand how offices work as spatial organizations (e.g. Sailer 2010; Steen 2009). In turn, sociological analysis has sought to map the structures of social interaction in formal and informal organisations (e.g. Ahrne 1994; Edling 2009). With reference to previous research in related fields (see Chapter 2), I provide context for the claims I make here. It is my interest to point the way for future research, should mediated spaces be incorporated and treated as architectural extensions.

In comparison to other societal changes, there has been remarkably little development in workplace design in the last century. In spite of having many variants, which have manifested through history, there still appears to be an emphasis on supporting individual work, carried out collectively. Individuals often work side by side and share the space, rather than work together. This is a form of collaboration which relies more on division of labour than on dialogic interaction and collaboration, and which hardly can be said to depend on human presence. Max Weber's concept of 'bureaucracy' (1947) and Frederick Winslow Taylor's concept of 'scientific management' (1911) were represented by an office design that imposed order, hierarchy, supervision, and efficiency. In the early 1900s, the task of office workers was to keep records and manage information, carry out meetings and discussions, make calculations, produce text, make decisions and plans (Sundstrom 1986). This mechanistic view of the workplace was visible in the physical planning of the workplace and implemented Taylor's idea of 'economy of motion', 'visual accessibility' and 'supervision'.[150] In spite of changes that have since taken place in work culture, this design standard in many ways still prevails.[151] And although contemporary work-life may appear to have radically shifted towards collaborative ways of working, under the surface much has stayed the same.

It could be argued, of course, that offices today hardly need to provide reflective space for individual work, if a (tele-)worker can find adequate spatial support in a remote (home) location, potentially with a positive effect in terms of sustainable development. The expected reduction in terms of personal travel may have implications for commuting, transport, the design of urban infrastructure, etc. Conversely, one may ask why the office should provide space for collaboration if teamwork mostly occurs via phone, email or video? To address

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extension of workplaces by combining real, virtual and mediated space in ways that enable an individual to monitor an avatar representation of one's office cell, by bringing it closer to those with whom one wishes to interact. One office avatar docked to another establishes a mediated space and enables remote presence ('Mixed Reality Architecture' 2009; Schnädelbach 2007).

[150] Sundstrom (1986: 49) reports that, around 1900, there was an interest among psychologists in the effect of the work environment on human behaviour. The influence of noise, temperature, ventilation and lighting was measured and related to the performance of workers. Such monitoring often produced negative result and workers' stress levels increased as a result of hiding their emotions (Donald 2001).

[151] Weber and Taylor are the two main contributors to classical organization theory (Sundstrom 1986; Donald 2001). Taylor's organisational theory for 'scientific management' was presented in 1911 and focused on work performance and efficiency. For Taylor, work needed to be broken down into its smallest elements and, using the methods of 'motion study', its most efficient procedures were to be identified (Sundstrom 1986). Sundstrom describes the relationship between the worker and workplace as a 'cog to a machine' and Donald, similarly, as follows: "Employees were viewed as extrinsically motivated and so intrinsically lazy, working only under supervision and motivated by financial gain alone. It was believed that when given the appropriate conditions, people would work to their optimum efficiency." (Donald 2001: 285) According to Sundstrom, Weber's theory is not directly related to spatial organisation. However, an employee's rank in the organisational hierarchy is represented through the use of signifiers in the workplace design, such as location, size of their workspace or furniture design (Sundstrom 1986).

these issues we must observe the foundations of the presence paradigm in relation to collaborative work practices.

How important is presence? Is it slowly losing importance in work-life contexts? Is workplace design irrelevant to the development of organizational knowledge? These are complex issues which I explore by discussing different approaches to presence in workplace design.

Two scenarios can be drafted. The first is one in which *co-presence* between workers is considered crucial for knowledge exchange and the production of organizational knowledge. Such a co-presence scenario, I argue, requires the support of workplace design to enable mediated interaction and thus contribute a broadened concept of presence.

The second office scenario is more dystopian. It rests on the assumptions that organisations rely more on individual contributions than on forms of collaboration which require interaction. In such a scenario (which I call the *no-presence* scenario), information exchange between workers is supported by different media and communication tools, but it is of less importance to bring the staff together in the workplace. In consequence, the office loses its capacity as a site for collaboration and knowledge exchange. The office, instead, risks becoming a site for storage, while the parallel development of mobile technical devices enable workers to contribute their individual shares from remote locations. This is collaboration in its most basic form, supported by information exchange.

Without a genuine need for knowledge sharing or human interaction in collaboration, the benefits of sharing spaces with others at work remain vague in terms of both economic (less space per worker) and social measures (particularly in case of routine work). Given the choice, it is likely that many workers will choose an individual office cell before an open plan workspace – arguing the need for seclusion rather than presence. Others will opt for the possibility, at least sometimes, to work remotely from home.[152]

[152]Discussing future trends, Koprowski (2000) argues that workplace flexibility is more important than job stability, salary, holiday time and benefits. Flexibility is often perceived as a status symbol. Similarly, Challenger writes: "Driven by employee demand for more-flexible scheduling, telecommuting will be the predominant workplace trend in the new millennium." (2000: 38) The above is confirmed by a user study aiming to define the drivers and barriers for teleworking in Sweden and Italy conducted by Ericsson AB. It asserts that in Sweden, an office worker expects a certain amount of teleworking, as part of the job, and partly because the job requires an involvement beyond what can be achieved within a fixed number of working hours, partly because employees enjoy the freedom of structuring their own work time. In contrast, Italian white-collar workers do not assume teleworking is offered in the job. It is regarded as "an exclusive option, primarily for those who are in more senior positions and have shown their employer that they can be trusted." (Ericsson AB user study 2008)

WORKPLACE DESIGN FOR COLLABORATIVE PRACTICES

In light of the discussion above, it becomes interesting to discuss what future work practices will actually need in terms of spatial support. How can workplace design incorporate real spaces as well as virtual and mediated spaces? How may these different spatial forms be combined?

While still experimental and tentative, the presence designs I present here suggest (and it must be remembered that several are merely prototypes), that the future potential of workplace design lies in the integration of media technology and spatial design to reinstitute the office as a site for collaboration and innovation. However, in spite of numerous attempts to find the correlation between spatial layout, creativity and capacity for innovation, none has yet been confirmed by research.[153] There is, in fact, little accordance among scholars from different disciplines as to how the relationship between space and organisation is constituted. Yet, communication and interaction are nevertheless keywords in contemporary work practices.[154]

We now turn from theory to practice, in order to observe how architects today design to support collaboration. But we will find little innovation beyond conventional conference rooms and bull pens, or workplaces for which mobile communication media is used to facilitate the transmission of data and information between individuals, but where little imprint of audiovisual media is noticeable in spatial design. As already suggested, twentieth-century office design has predominantly focused on individual work performance based on rational business organisation models. In terms of the physical distribution of space, there has been an emphasis on individual workspaces, sometimes physically separated (cellular office) sometimes grouped together (bull pen, open plan office landscape), in ways which primarily favour overview and control. The concept of collaboration represented by such office designs is one where individuals efficiently pass work to one another in an organisation with clear divisions of labour. Designated areas for collaboration in the canonised layouts are generally conference rooms equipped to different degrees with communication technology and interaction tools, some of which in recent years include video communication facilities. Recent bull pen office designs in Stockholm, such as the 2004 Swedish Post Office and OM Headquarters, illustrate this point (see photos below).

Many attempts have been made to categorize experimental office designs which were introduced and widely published in the mid-1990s, but which, in retrospect, were perhaps more innovative in terms of organizing work than as spatial design.[155] Literature from the time shows countless best-practice examples, suggesting an implicit relationship between extravagant design and company success. Addressing this complex relationship, Frank Duffy (1997) brought structure into the debate, proposing a workplace typology which focused on the level of autonomy and interaction of staff, by means of a matrix which placed workplace designs in one of the following categories: the *Den* (an office which hosts group processes), the *Hive* (hosts individual processes), the *Cell* (hosts concentrated study), and the *Club* (hosts transactional knowledge). Putting forth the suggestion that an office may fit more than one category, Hascher et al. (2002) contributed an activity-based model combining four

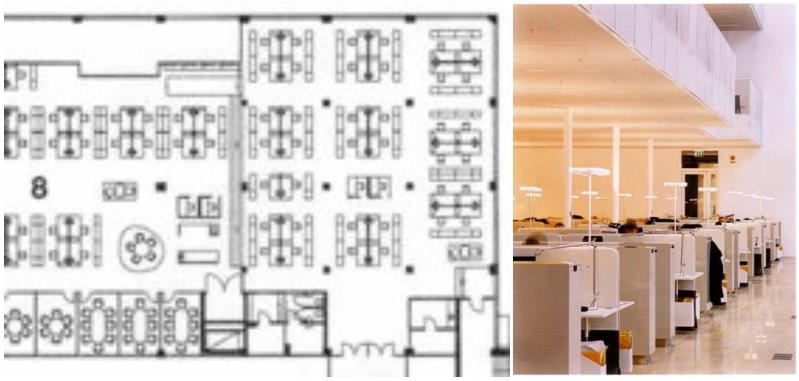
[153] Sailer & Penn (2009) have summarized research from disciplines as diverse as psychology, sociology, organisation and management studies, architecture and design, concluding that few consolidated findings exist in this field. She explains the inconsistency of results partly by a difference in methodologies. Cf. Peponis et al. 2007; Penn et al. 1999. For an overview of space syntax theory as recently applied to workplace design, see also Steen 2009; Sailer 2010.

[154] What further complicates this issue is that, to date, space syntax data collection is based on workers' movements and interactions inside the workplace, but does not include the use of media and communications – the means on which workers increasingly rely in workplaces, technologies that, as suggested here, provide the potential to reform workplace design.

[155] Office design concepts include e.g. 'Hotelling', 'Just-in-time', 'Hot-desking', 'Action office', 'Flex-office' and others (Worthington 1997; Zelinsky 1997; Raymond & Cunliffe 1997; Tuner & Myerson 1999 Becker 2004; Gullström & Westerberg 1998; Chistiansson & Eiserman 1998).

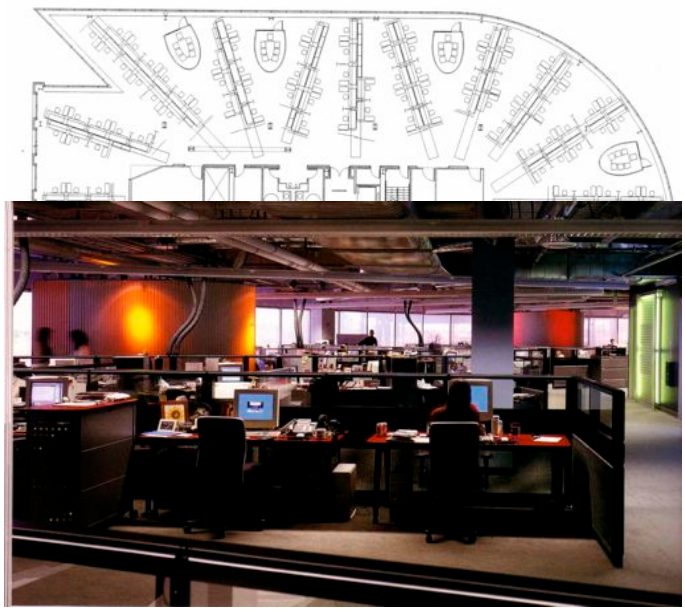
processes: *individual, group, concentrated,* and *transactional.* Myerson and Ross (2003) similarly proposed the concepts *narrative* (the office as brand experience), *nodal* (the office as knowledge connector), *neighbourly* (the office as social landscape), and *nomadic* (the office as distributed workspace). In a later publication, Myerson and Ross proposed the office as *academy, guild, agora* or *lodge* (Myerson & Ross 2006). However, under closer inspection it becomes clear that many of these design categories are variants of the previous typologies.

105. Swedish Post Office, Stockholm. Designs by BSK architects 2004. From 'Arkitektur' 2004, No 2.



106. OMHEX offices, Stockholm. Designs by Sandellsandberg 2004. From 'Arkitektur' 2004, No 3.

107. The informal interior design at the consultancy Chiat/Day in New York illustrates the club-concept (Duffy 1997). This is an informal social space which enables reflective work and teamwork, a variant of a common room or coffee area.



108. Offices for RealNames, San Francisco, categorized as 'Nodal' by Duffy (1997), although one could also refer to it as bull pen or open plan.

In effect, the development of the mobile network society, which Manuel Castells has observed (Castells et al. 2007), appears to have had little impact on or relation to workplace design. Partly triggered by new communication technology introduced in the last decade of the twentieth century, the concept of work was undoubtedly altered in a very short span of time. Today, for example, the work of most Swedish office employees is characterised by mobility and frequent work encounters, with each person often engaged in several parallel projects. As a result, many are able to perform work tasks from different locations, either from home or in transit. This development is perhaps especially apparent in Scandinavia and northern Europe, where change is possibly facilitated by a combination of geography, non-hierarchic business models and strong unions (van Mehl 2000).

Surprisingly, therefore, the development towards project-based organisations has only marginally resulted in new workplace design or in offices specifically designed for collaboration. There is a noteworthy paradox in that recent 'white-collar' technology — such as laptops, mobile phones, and other portable 'convergence' devices – while appearing to provide greater flexibility and mobility to the individual – privilege isolation, or at least remoteness from physical collaboration (or interaction). It is usually collaboration that creates the need for human mobility, since the remote collaborator usually has to be physically transported to the office meeting (or conference, sales pitch, etc.).

One conclusion we may draw is that that the tools for communication have changed, but that project-oriented organisations have not accordingly altered the nature of collaboration in offices. The model of work still appears to depend more on a planned individual contribution rather than on dialogic interaction between workers, a concept borrowed from Mikhail Bakhtin (1984), who claimed that dialogism is a basic principle on which all essential human interaction is based.

Whether open plan or cellular, the office is still functional, but serves as a host for interaction and information exchange rather than as a site for dialogic interaction. In effect, today's office has become a site for reflection and solitary work, which increasingly can be performed elsewhere.

By distinguishing between two approaches to collaborative work, one more light-weight, which involves communication between workers but no closer form of interaction, and one which is more genuinely based on dialogic interaction, I suggest that communication between individuals has been increasingly facilitated in the workplace. This has come about

not by changes in spatial design, but through the combination of project-oriented work models and communication technology. The emphasis on communication has prompted researchers to focus on the development of tools that facilitate communication and mobility. I shall relate this development to the earlier-drafted *no-presence* scenario.

In turn, the second form of collaboration genuinely requires dialogic interaction and human presence to facilitate the exchange of tacit knowledge. This, I argue, has less successfully been supported in office design. The reason is that dialogic interaction between workers arguably requires more from its spatial design than what the traditional bull pen and cellular office provide. There is potential, however, for a reformed workplace design and co-presence scenario, as illustrated by the attempts to design mediated architectural extensions. We are now close to the distinction proposed earlier, between a *co-presence* and a *no-presence* scenario.

One bit of the puzzle, still missing, concerns previous attempts to alter ways of working by introducing new collaborative models that facilitate dialogic interaction in the office. If my analysis is correct, and dialogic interaction requires presence, then why have previous attempts failed? Or did they? Perhaps they were very successful within their specific contexts, but the subsequent efforts to generalize office design failed. We may need to accept that basic communication between workers suffices for a majority of workplaces, whereas a limited few require more intensive forms of collaboration.

As early as 1924, the 'Hawthorne Studies', a user study conducted at the Western Electric Company in the US, revolutionized management theory by contributing a 'human-relation' approach to workplace efficiency. Its aim was to identify the "optimum physical working conditions necessary to achieve maximum productivity." These studies claimed that:

> …workers define their own roles and norms, which may be different to those prescribed by the organisation; people are motivated by more than purely financial reward; employees work as collectives, often with informal leaders who can neutralize the power of formal leaders; communication within an organisation needs to be two-way and participation important in decision making. (Donald 2001: 289)

Continued studies by Homans focused on interpersonal relations and the distinction between informal and formal relationships within an organisation (Homans 1950). Homans' belief was that proximity between workers and frequent interactions would result in a positive work atmosphere. In contrast to classical organization theories, the human relations movement can be said to have placed more focus on groups and teams (Sundstrom 1986). It would, however, take several decades before these ideas were, temporarily, implemented in workplace design.

The original vision of the Bürolandschaft

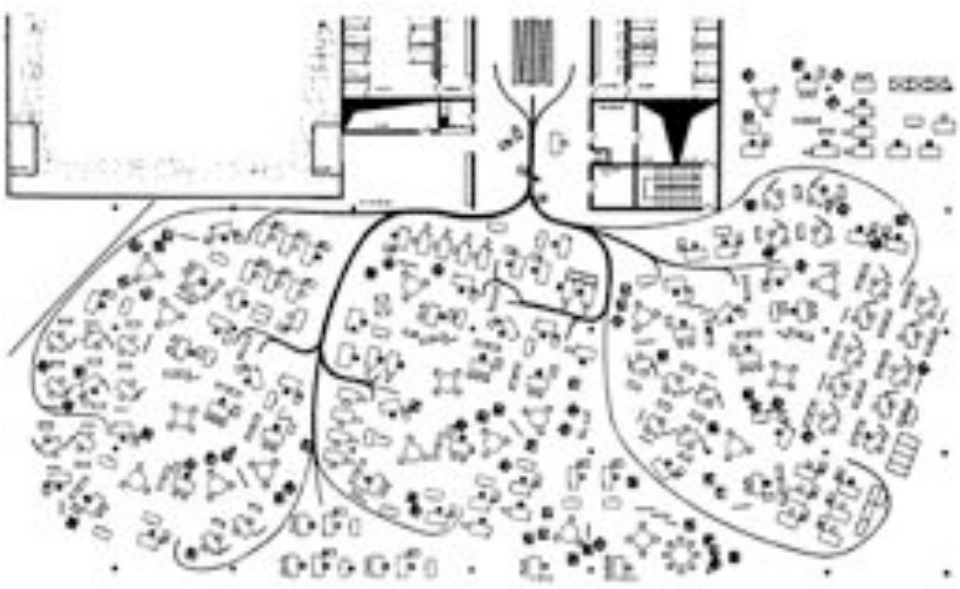
> Nothing had prepared us for those curious German drawings which actually showed desks, hundreds of desks, randomly arranged in great open spaces. (Frank Duffy in 1979, as quoted by Veldhoen & Pipers 1995: 34)

Frank Duffy was not alone in expressing such surprise. When the two brothers Wolfgang and Eberhard Schnelle introduced the open plan office landscape in 1956, they took architects and planners by surprise. They formed a German team of architects and management consultants, the 'Quickborner Team für Planung und Organisation' in 1959, which they named after one of their first office designs in Quickborn. The original vision was to support and increase communication between office workers by placing them close to each other in an open space.

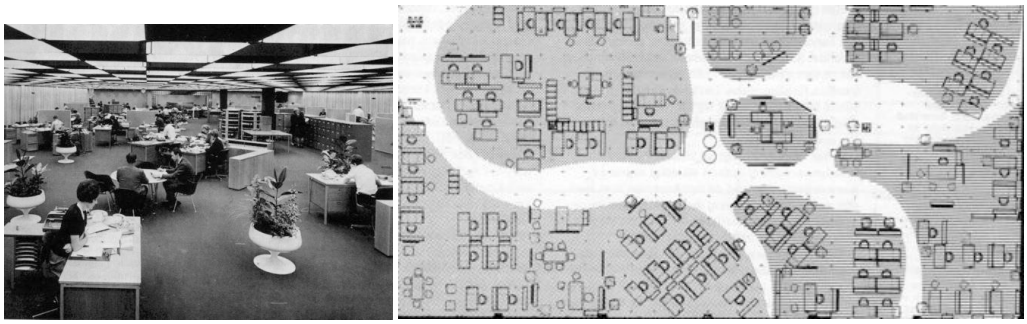
At the time, Wolfgang Schnelle described the need for a modern office that effectively managed verbal communication, arguing that written communication would increasingly become automated (Christensson & Eiserman 1998: 21f). The office landscape explicitly avoided an indication of status, by placing managers and staff together. There were no

private offices, but allocated areas for informal meetings in an open space, where an irregular arrangement of furniture with broad circulation paths enabled desks to be moved when required (Duffy 1992; Laing 1997; Sundstrom 1986; Pile 1978).

Privacy was an important issue, which was addressed through mobile and free-standing curved acoustical partitions which were easily moved around the office. Plants were also used to separate workspaces.



109. Office landscape by Kurt Ansleben and Quickborner Team for a German company in 1968. Office cells and meeting rooms were replaced by freely located groups of furniture, placed according to patterns of communication. The organic lines denote circulation paths. (Pile 2005: 392)



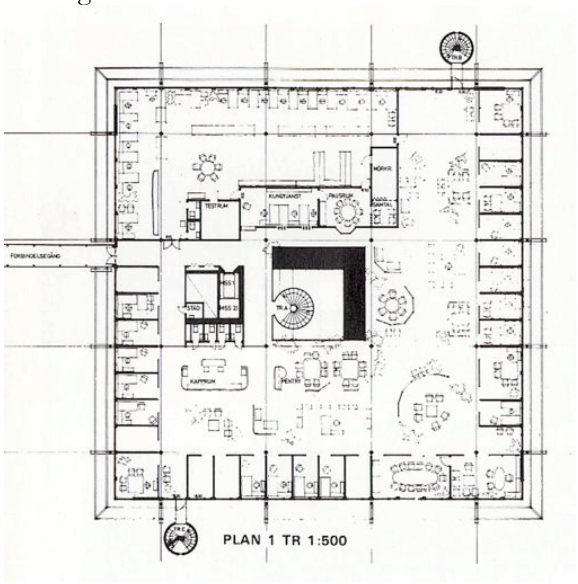
110. The open office landscape as interpreted in Sweden, for Volvo in Torslanda, 1967.

In spite of early criticism directed at the different interpretations of the landscape, the concept spread quickly and a variety of adaptations soon appeared in different countries (Sundstrom 1986). Design practitioners, as well as users, raised objections and sparked a heated debate. In Sweden, for example, critics pointed towards bad lighting (too much of it, too flat, only from above), acoustics (no acoustic ceilings yet in place), and poor ventilation, whereas other parties spoke favourably about the benefits in terms of economy (Christiansson & Eiserman 1998). This produced an informed discussion about the design process. Today's office landscape has little in common with the Schnelle brothers' original design concept, except for the common feature of the open plan.

The Canon combi-office

Several attempts to design customized workplaces that support collaboration and teamwork, so-called 'team space designs', were undertaken in the 1980s. One such example is the

'combi-office', which was introduced by the Swedish architectural firm Tengbom in 1978 as part of their design for Canon's headquarters in Stockholm (Bejne 1979). Whilst each worker within a combi-office was still given an office cell, the concept allocated the centre of the building for teamwork.



111. The first combi-office, designed for Canon's Swedish headquarters in Stockholm (1978) by Åke Bejne of Tengbom Architects. Each cell has a modular unit of 2,4 m. As is shown here, the glazed partition let light into the centre interior of the building, a common area allocated for teamwork and informal meetings. The glazing was an important original feature of the combi-office, which was sometimes lost in later adaptations. If workers preferred curtains and audiovisual separation from the common area, this resulted in dark interiors. Picture from journal 'Arkitektur' 1979: 4.

The combi-office spread widely, especially across Scandinavia, where its popularity was related to the introduction of computers in the workplace. In the early 1980s, computers were still few, and often shared within one group of workers in the common centre area. In a short space of time, however, they became personal tools, and the combi-office quickly lost some of its original benefits: the centre space was emptied, used for storage or to provide second-class workspaces for certain members of staff, while all office cells were equipped with computers. One could speculate whether the introduction of the combi-office was untimely, as its potential to support collaboration was overtaken by the swift spread of personal computers. The combi-office did not change the nature of work, computers did – or rather, computers reinforced the nature of individual work, which continued to be widely adopted.

Flex-office teamspace design

Some attempts to support collaboration in the early 1990s were more explicitly rooted in organizational change and an urge to quicken the pace of product development in order to meet market demand.[156] The need for increased teamwork produced other kinds of spatial support for collaboration than meeting rooms (Duffy 1997). Such were the intentions when Ericsson, the Swedish telecommunications company, introduced an organizational teamwork model called *Core3*, for which they commissioned my architectural firm to contribute the

[156] Stalk & Hout (1990) emphasized the need to redesign the work process in order to minimize the process times for developing and producing new products in a book called *Competing Against Time*. Hammer & Champy (1993) discussed the change whereby workgroups have shifted from functional departments to process teams, managers change from supervisors to coaches and organisational structures have changed from hierarchical to flat. Advocating the benefit of the 'learning organisation', Peter Senge's book (1990), *The Fifth Discipline – The Art and Practice of the Learning Organisation,*' discussed the role of intellectual knowledge in work organisations.

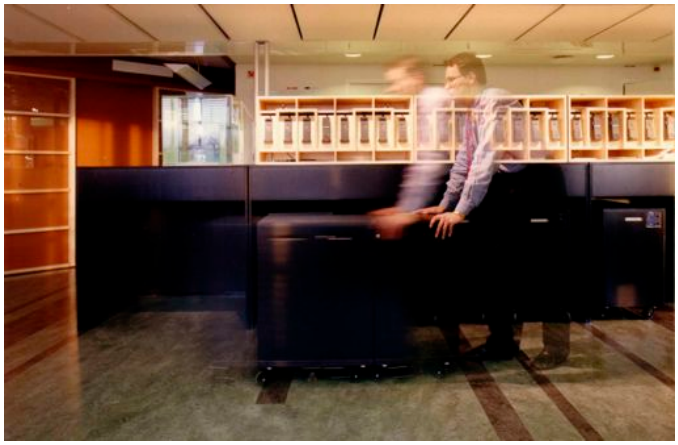
spatial design (Ericsson AB 1993).[157] The *Core3* concept was based on close collaboration and knowledge exchange between a team of three employees who possessed different skill sets: technical development, marketing, and project management, respectively. The conventional cellular layout at Ericsson did not make close collaboration possible, and the client was explicit in stating their need for innovative spatial design that would support teamwork. Reflecting on my design experiences a few years later, I recalled the client's frustration with and dismissal of conference rooms, which they considered formal and time-consuming (Gullström & Westerberg 1998).[158] Meetings were spontaneous and increasingly carried out in door openings and along the narrow cellular corridors, all of which prompted the radical redesign of their workplace. As architects, we responded with a concept that we labelled 'flex-office', which answered to Ericsson's need to frequently reconstitute workgroups, and which was adapted to different organizations in subsequent years.[159] Our understanding of the term 'flexible' was that individuals were more mobile and flexible than 'workplace design' can ever be.

112. In the early 1990s, mobility in the workplace was limited and experimental, illustrated by initial attempts to integrate computer networks and cordless telephones to workplace design, as shown above at Ericsson Business Networks in Stockholm (1993). The flex-office concept was introduced by my firm in 1992, and focused on the new mobility of workers enabled by computer networks and cordless telephones. Our design allowed an individual to sit down to work anywhere in the office. Computers and plants were integrated into the furniture design. Work was collaborative and organised as short projects lasting 3-10 weeks. Teamwork and documentation were hosted in allocated 'project-pavilions'. Designs by Gullström & Westerberg. (Photos in Gullström & Westerberg 1998)

[157] Between 1993 and 1995 my firm was responsible for over twenty workplace designs (refurbishment and interior design comprising approx. 20 000 sq m office area), following extensive participatory design processes involving over 400 Ericsson employees. I was the responsible architect for half of these. See Gullström & Westerberg (1998).

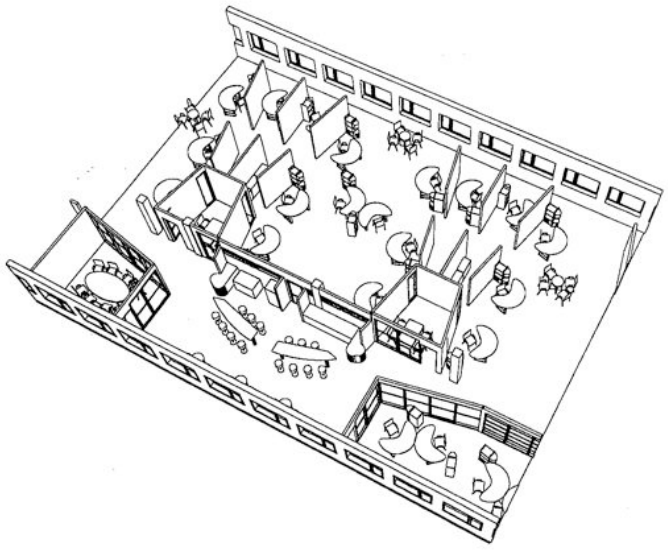
[158] Personal communication 1993-97 with Vivianne Wennersten and Bo Widén, responsible for the *Core 3* project ('*C Project – Invisible Management*') at Ericsson Radio Systems AB.

[159] I have only listed those for which I was responsible; see Appendix 2.



113. Upon entry to the office, workers would pick up a cordless phone (charging through the night) and one's mobile work desk, then sit down by a computer-dock of choice.

As architects, we also proposed that an office should provide access to four different spatial entities: teamspace for collaboration, informal social space, performance space and reflective space. All but the last of these spaces was designed to specifically support collaboration.[160] The need to establish the office as a hub for communication exchange was stressed in a time when staff increasingly worked in parallel workgroups and often attended meetings outside the office. On return to the office, it was deemed important to provide informal social spaces (such as a combined coffee area, meeting bar, hub for internal post, copy and fax corner) to support a shared sense of community in an allocated space where explicit as well as tacit knowing could be exchanged. An employee would thus have access to each of the four spatial entities in the workplace, each of which encouraged different kinds of interactions: formal as well as informal meetings with colleagues.



114. Axonometric view of a flex-office design by Gullström & Westerberg. From Siemens Nixdorf project 1997-98

Our later flex-office designs focused on the need to support collaboration within a temporarily constituted workgroup, as above, where each employee had access to all the four spatial categories: a desk as part of a teamspace, partitioned work space for reflective work, meeting rooms (performance space), and coffee facilities (informal social space).

[160] The same categories were also used a few years later, as part of the spatial programming for an innovative learning environment, *The Learning Lab,* at KTH, for which my firm was responsible (Gullström & Westerberg 1999). See also project archive, Wallenberg Global Learning Network 2010.

115. Flex- office by Gullström & Westerberg. From Swedbank project 1998-99.

Juriaan Van Mehl has compared our Swedish flex-office designs for Ericsson in Stockholm to designs for Ericsson's offices in Guildford, UK from the same time, seen below. He relates the differences in design to a difference in work culture (van Mehl 2000: 100f). His comparison shows that our flex-office designs were experimental and fairly unique to the Swedish work culture. The UK work culture is represented by bull pen office designs, at the time referred to by names such as 'hotelling' and 'hot-desking', which were meant to promote mobility and workplace efficiency, but showed fewer attempts to design dedicated work areas for collaboration.

116.Ericsson's offices at Guildford, UK (from van Mehl 2007: 100f). My interview with the architect at the time confirmed that in contrast to Sweden, it was an overall foreign idea to UK office workers in the mid-1990s that one would sit down to work in an allocated coffee area. One would preferably not sit down there at all, since one's mere presence there would suggest absence elsewhere, namely at one's desk.

Here – or no way near? The future of workplace design

In spite of various innovative approaches to office design, spatial attempts to specifically support collaboration have had few followers. This chapter concludes that contemporary workplace design is still based on a typology derived from an older society and paradigm of work. I began by arguing that society has moved on from this presence-in-person paradigm and that we currently find ourselves in a phase in which presence is negotiated.

I introduced two possible scenarios and discussed different models of work – some more collaborative than others, in order to address the complex relationship between knowledge sharing, presence, and workplace design. I distinguished between models of collaborative work, which to different degrees enable workers to make individual contributions – for which presence is not necessary, yet valuable – and more participatory models, which require presence. One can perhaps describe this as a tug-of-war between participatory models of work and the fast development of mobile technical devices, which are independent of place,

and demand little from workplace design, thus yielding the no-presence scenario. The potential for a co-presence scenario was argued using examples of mediated workplace design. Whereas commercial presence technologies primarily provide alternatives to face-to-face meetings, we looked at examples which aimed to support lateral interaction and peripheral monitoring, which are of major importance to more advanced forms of collaboration.

Does it suffice to conclude that mediated spaces can support collaboration, close affinity and knowledge sharing as adequately as real spaces do? Hardly so, but this discussion has helped us to pinpoint what we mean when we say 'as well as real spaces'. For how well do the open plan and cellular offices support collaborative practices, really? As noted in space-syntax theory, a correlation between spatial design and increased human interaction hardly exists (Steen 2009; Sailer & Penn 2009; Sailer 2010). I maintain, however, that certain aspects of collaboration are neglected in both research and contemporary workplace design, for the reason that mediated forms of communication are not considered in relation to spatial design.[161] While workers increasingly rely on new means of communication, some of which may be video-mediated or virtual, these are not included in space syntax data collection, as they are not perceived to have a relation to spatial design. I suggest this may lead towards a pattern of work which is people-independent as well as place-independent. The office becomes a site for storage and loses its potential as a site for knowledge sharing. While the individual delivers work from anywhere, the office thus facilitates less collaboration. We are back at a distributed variant of the bull pen, but one which nevertheless favours individual work. One can perhaps say that workplace and workplace design will become increasingly ineffective or insignificant.

However, organisations concerned with collaboration and knowledge sharing may find that they still need effective spatial strategies. In these cases, a combination of real and mediated space may provide just that. While people can work anywhere to perform individual work, advanced forms of collaboration need a kind of spatial support that mediated workplace design can provide. By integrating remote presence and mediated interaction into spatial design, the office is reinstituted as a site for information exchange and knowledge sharing. When large corporations therefore consider presence technologies, it is worthwhile to ask whether the investment primarily serves to facilitate communication between workers, or to support more advanced forms of collaboration. In the latter case, the integration of technology and spatial design can enable one to work remotely, yet still be part of a team.

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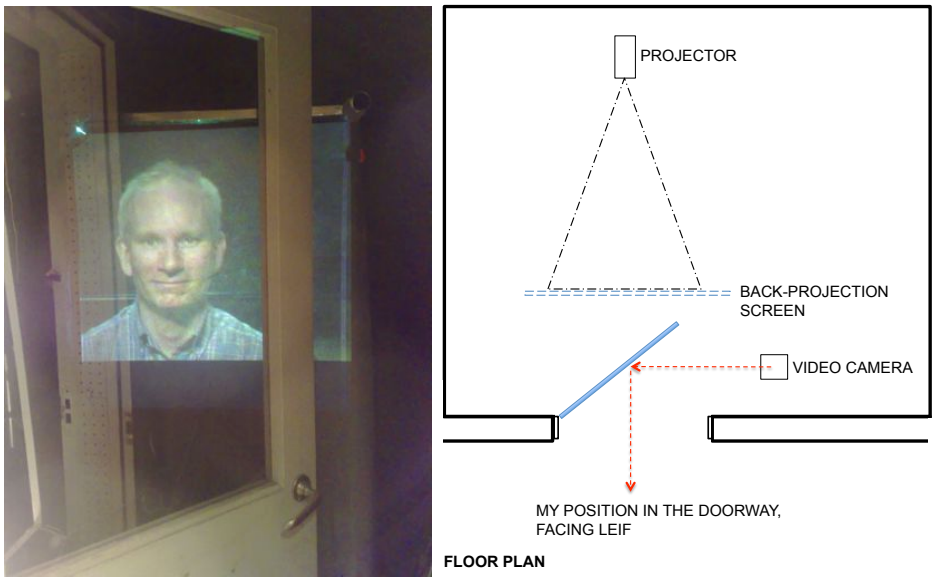
[161] Steen (2009) reports space syntax studies which observe how workers interact face-to-face, using mail and telephone respectively.

chapter 5 gaze and mutual gaze

5

Our design concept to enable mutual gaze.



117. As part of our prototyping for the Mediated Museum project, we used video displayed via back-projection onto a screen of matted acrylic glass. In this case the back-projection displays an image of my colleague Leif Handberg who looks straight at me, namely at eyelevel. I am standing in the doorway, facing Leif. The glazed door (here, a standard 5 mm sheet of glass, as part of a 1950s door) opened at 45° provides sufficient reflection for the video camera. The camera which captures me is hidden to the right, out of view. It is the fact that this camera captures me as I am reflected from the glass at 45° which enables both parties to experience mutual gaze, without cameras interfering in the projections.

My colleague Leif Handberg and I developed the set-up above as a simple and inexpensive means to enable mutual gaze. Our adaptation of Rosenthal's teleprompter from 1947 has been described earlier (see illustration 13, Chapter 1) and is discussed again in the current chapter. As previously mentioned, we strive to create architectural extensions where no technical equipment is visible and no self-monitoring is required by the user. A benefit of our design concept is that no camera is visible. Our experience from various user studies is that when people are made aware of either their own image, or a camera, they sometimes act as if they are onstage and the experience of a spatial extension and mediated presence is subsequently lost.[162]

There are many ways to enable mutual gaze, and of those we have sought the most simple and inexpensive. As is noticeable above, we have made several successful prototypes with standard glass, often finding that the coating of energy glass sufficed for the reflective capacity required.[163] On other occasions, we have chosen to simply place the camera on a tripod in front of back-projection screen (on which a remote location is displayed), or we have made a hole at an approximated eye-height in a screen, as seen in the example of the *Mediated Control Room* in Appendix 1.

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[162] Many video-conferencing systems, as well as online presence technologies (such as Skype), include a small display depicting the local user. Its function is often to avoid that a user stays within the shared mediated space. However, to see oneself – as if in a mirror – whilst addressing a remote party, is counteractive to the experience of a mediated spatial extension: when people address each other face-to-face inside real spaces, mirrors are never placed in this way.

[163] However, in order to maximize quality and to avoid the effect of double exposure in the reflection, we finally chose the glass quality Amiran, copyrighted by Schott AG. This has an antireflective coating and was ordered to fit the specifications of the mediated glass door in the *Mediated Museum* project.

INTRODUCTION: THE ROLE OF GAZING

> The eye is a simple optical instrument. With internal images projected from objects in the outside world, it is Plato's cave with a lens. The brain is the engine of understanding. (Gregory 2002)

Quoted above is the neuropsychologist Richard Gregory. As early as 1966, Gregory provided a psychological and physiological explanation of the way that vision functions as an interpretive action. His concept of 'the intelligent eye' suggests that seeing is ultimately an activity of the mind. Through testing a series of hypotheses, Gregory showed that the mind attempts to understand what is seen on the basis of its prior experience (Gregory 2002).

Cognitive psychology divides eye behaviour into two categories: gaze and mutual gaze. Gaze refers to an individual's looking behaviour, and mutual gazing occurs when two individuals look directly at one another, usually face-to-face. In dialogic interaction, people sometimes look at one another in the region of the eyes; their eyes meet in a deliberate or accidental way, and they establish eye contact. As a component of facial expression, gaze is a powerful part of our emotional expression that regulates social interaction in face-to-face communication. The role of gaze in human interaction is of considerable importance, as illustrated in the case of the therapist who treated her patients remotely, which I referred to in the previous chapter. Eye contact signals the intimacy of the interaction and different techniques are used to control the direction of the dialogue (Argyle and Dean 1965; Allen & Guy 1974). Several scholars have asserted that failure to develop typical mutual gaze behaviour is one of the earliest signals of severe social and communicative disorders, or of autism.[164] Although the therapist, in our case, did not document her patients' gaze behaviour, she remarked that the mediated workplace was especially suitable for neurotic patients in need of practicing mutual gaze behaviour (Ekman 2003).

When people interact under certain conditions, they are able to discern which area of their face is fixated upon by another person's gaze. Yarbus (1967) showed that people use a series of fixation points, located on different parts of the face, focusing on each point for 0.33 seconds. Eyes were frequently chosen as fixation points, as seen in the picture below.

Michael Argyle and Mark Cook's findings are of related interest. They have concluded that "if a small area of fixation is used, if they are not more than a metre away, and if viewing conditions are good" then interactors or observers will be able to tell which area of the face is being fixated upon (Argyle & Cook 1976: 47). They also note that interactors can fairly correctly identify where the other person is looking, especially when the eyes of the two persons are aligned (research cited in Argyle & Cook ibid.: 43f).

Adam Kendon has similarly observed how glances are used in conversations and proposed that gazing supports four different functions in communication: *regulatory*, *monitoring, cognitive*, and *expressive* (Kendon 1967). The regulatory function of gaze may include signals that indicate turn-taking. Kendon showed that to produce synchronising, gaze is used to indicate when a speaker is about to finish speaking. Monitoring serves to show concern for the other person. Gazing indicates cognitive activity when the eyes are averted or shifted to one side or the other. This has been observed to occur more frequently when the listener is asked to reflect on a question (Bakan & Strayer 1973). Similarly, Goodwin (1980) showed that there are subtle forms of coordination between utterance and initial restarts and shifts in participants' eye gaze (hence attention) towards the speaker. It has also been argued that the most important aspect of vision is neither gaze nor mutual gaze, but visual access to the whole person (Rutter et al. 1984).

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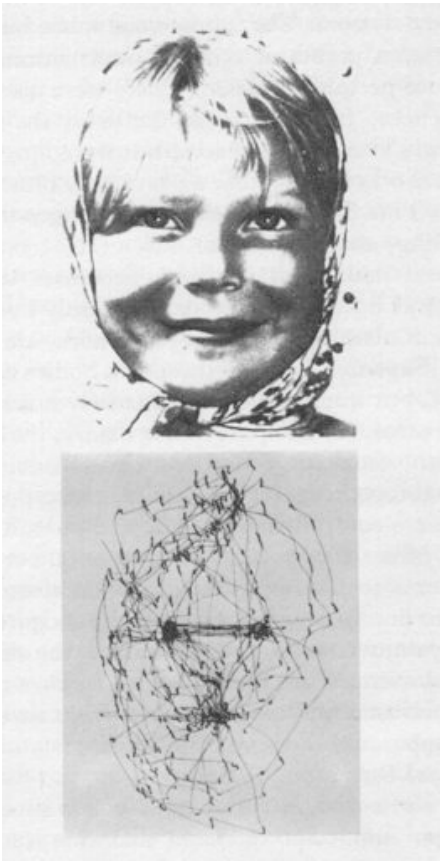
[164] This extensive research is referred to by e.g. Senju & Hasegawa 2005: 128; and Argyle & Cook 1976: 127ff. Argyle and Cook recommend treatment to correct gaze patterns by means of role-playing with video-tape play-back and refer to studies where autistic children have been successfully treated with similar methods, resulting in an increase in their level of gaze (Argyle & Cook 1976: 175), which is of relevance to my study the *Mediated Therapist*.



118. The eyes are most frequently chosen as fixation points, but gaze moves across the face. Based on Yarbus (1967) who recorded eye-movements while a person looked at a photograph for three minutes. (Picture from Argyle & Cook 1976: 19)

Several aspects of gaze have been reliably recorded to be of major importance in social behaviour. These must consequently be considered when designing mediated environments.

Argyle and Cook report that if a person A is within 3 to 4 metres of person B, then "B can perceive face-directed gazes quite easily, as can suitably placed observers. The fixation of gaze on eyes or on other parts of the face can only be detected at closer range, e.g. 1 metre, but gaze is not normally fixated in this way. Direction of gaze is inferred from the orientations of the other's eyes and head; normally the two move together to constitute a 'face-reaction'." (Argyle & Cook 1976: 169) They also describe gaze as a primary channel for receiving visual information, which becomes a signal alongside others in non-verbal communication. It is also known that the sequence of glances is closely connected to the sequence of speech, and that these glances are organised to simultaneously send and receive information. Thus it follows that gaze plays an important role in both verbal and nonverbal communication.

Michael Argyle has shown that the perception of eyes, face and other non-verbal signals during interaction has three functions: (1) to help with the synchronizing of utterances, (2) to provide feedback, and (3) to provide additional non-verbal information which may elaborate and modify verbal messages (1975). An earlier study of non-verbal communication showed that speech is closely dependent on non-verbal signals, communicated by (1) facial and gestural signals which are perceived visually; (2); non-verbal vocal signals, which are heard; (3) bodily-contact and smell (Argyle 1972). Thus, Argyle and Cook argue that "[g]aze operates twice in the facial-gestural channel – to open and close this channel, and as a visible signal itself" (Argyle & Cook 1976: 120).

The following list, which I quote at length from Argyle and Cook, shows that gaze is intricately connected with language and interaction in three main ways: (1) as a visible signal; (2) as a channel; and (3) through aversion of gaze:

> 1. As a visible signal:
> (a) Long glances are used by speakers as full-stop signals, and for other grammatical breaks.
> (b) Glances are used by speakers to emphasize particular words or phrases, or to make the whole utterance more persuasive. Other kinds of commentary on the utterance can be given by varying facial expression.
> (c) The line of regard is used to point at persons or things, e.g. to suggest who should speak next.
> (d) Glances are used by listeners to indicate continued attention or willingness to listen. Aversion of gaze means lack of interest or disapproval.
> (e) Glances made by listeners after particular points of an utterance act as reinforcers, and encourage the speaker to produce more of the same.
> (f) Glances made by listeners vary in meaning with facial expression, including that in the region of the eyes; raised eyebrows indicate surprise, fully raised eyebrows disbelief, lowered eyebrows puzzlement, fully lowered eyebrows anger.
> (g) Gaze is one signal among others for the communication of interpersonal attitudes; however, there is no linkage with speech here, glances are simply longer or shorter and accompanied by different facial expressions.
>
> 2. As a channel:
> (a) Speakers look up at grammatical pauses to obtain feed-back on how utterances are being received, and to see if others are willing for them to carry on speaking.
> (b) Listeners look at speakers a lot of the time, in order to study their facial expressions, and their direction of gaze.
>
> 3. Aversion of gaze:
> Gaze is used intermittently, so that when it is used it gives a signal. The reason that people do not look all the time is probably to avoid overload of information. This also has a regular linkage with speech – there is aversion while speaking rather than while talking, at the beginning of utterances, and during hesitant pieces of speech. There is a lower level of gaze when cognitively difficult topics are discussed. Aversion of gaze can act as a more or less deliberate signal that a person is thinking. (Argyle & Cook 1976: 121f)

The link between gaze and speech is explained by three factors: (1) The vocal channel requires that people take turns to speak, and signals are therefore needed to negotiate turn-taking; (2) A person who is speaking needs feed-back on how others react. Although this could be provided by vocal comments, Argyle and Cook remark that this "would involve double-talking, so feedback signals are also relegated to the second channel." Finally, they claim that (3) the various meanings of gaze, when used as a signal, "are all derived from its power to increase arousal, and thus act as emphasis and reinforcement, combined with different facial expressions" (ibid.: 124). The researchers compare this to the situation of a child learning to speak: mutual gaze with another person and shared focus upon objects of mutual attention creates cooperative sequences, which in turn constitute a foundation for human social behaviour (ibid.: 14).

Furthermore, our eye-movements are controlled by different neural systems. For example, it has been concluded that verbal questions often produce a shift of gaze to the right and downwards, whereas spatial questions produce a weaker shift to the left and upwards, or no shift at all (ibid.: 23).[165]

From their extensive overview of existing research and empirical studies, Argyle and Cook further conclude that two people in dialogic interaction will either look at each other, at objects of mutual interest, blankly stare into space, or at irrelevant objects. When an object of mutual interest, such as a game or a shared work document, is placed between two people,

[165] Of interest is also a study by Streek (1993), which showed that eye gaze might perform 'pointing functions'.

they will look at these instead of at one another. Argyle and Cook conclude that in the situation of a competitive game, for example, efforts are made to secure the other's cooperation and to get feedback, which results in less need for mutual gaze (ibid.: 104).

Evidence of 'poorer synchronizing' in mediated interaction

Argyle and Cook refer to a study of telephone conversations which showed that interactors who cannot see each other compensate verbally for the visual cues usually provided by gaze:

> [W]e react to such cues, by saying more, or saying less, possibly without always being aware of them. If we cannot see the person, one of two things will happen. He may replace the smiles and nods by audible equivalents – such as 'mm-hm', 'that's right', 'how interesting' – or else we will remain in ignorance of his reactions to what we are saying. (ibid.: 154)

Telephone conversations in which participants are not visible to one another show evidence of poorer synchronizing, which means more pauses and other signals. Argyle and Cook's findings are of interest to my design-led research: in the absence of visibility (hence gaze and mutual gaze), these functions are either not served at all, or are replaced by other signals. Of further interest is that utterances are longer, but people interrupt each other less often when they cannot see each other. Studies show that factual information can be conveyed equally as well (unless diagrams or graphic elements are involved), which has allowed researchers to investigate the 'effectiveness of communication' (ibid.: 163f).

Similarly pertinent to my design examples (particularly that of the *Mediated Therapist*) are results from other fields of research. Within medical sociology, a large body of research is concerned with survey, observation, and interview techniques that are used to analyze patient-doctor interactions. This field is commonly attributed to the sociologist Talcott Parsons. Based on ethnographic methods, audio-taping is frequently used in such studies. Christian Heath has argued that such methods disregard valuable visual aspects of interaction. In a series of studies, Heath has argued for the benefits of using video to record visual as well as vocal aspects of research consultations. Heath argues that a shift from audio to video may cause a paradigm shift in research "akin to the impact of the microscope on biology", were it not for the absence of an analytic framework for interpreting visual data. This, however, provides context for his later contribution of conceptual research tools for conversation analysis (Heath & Nichols 2006). Heath studied the organization of speech and body movement (especially shifts in posture and eye gaze) during medical consultations, whereby patients directed their doctor's attention towards a part of the body that required medical attention. Using videotaped recordings of natural patient-doctor relations in medical consultations, Heath focused on detailed and brief segments of a large body of data. Heath proceeds to describe the combined verbal and visual queues through which the patient establishes co-presence with the doctor throughout the interaction (1984: 243). By orienting his/her gaze towards the doctor, a patient puts him/herself in a recipient mode, allowing the doctor to construct the next utterance. Thus body movements work in conjunction with speech at the point when the interaction is begun. Heath found that eye contact and other non-vocal activities are used in the opening of the interactions for various purposes; one is to aid in the transition into addressing the business at hand.

The above research is relevant to presence design, because human behaviour in mediated spaces resembles behaviour that occurs in real space. As described in an earlier section, Nevejan (2007) distinguishes between (witnessed) mediated presence and natural presence, to illustrate the possibility of establishing trust in mediated interaction.

Given that in mediated interaction each party is located in real space, and that it is possible to design an architectural extension that facilitates the experience of (witnessed) mediated presence, the above studies are applicable to presence design. Such studies provide useful information to presence designers, who can benefit from a better understanding of how non-verbal communication is integral to social interaction.

Several later studies have used video to assess social behaviour in real space, as well as mediated behaviour. These provide results of more limited interest. To some extent, their limited impact can be explained by the fast development of technology, which may quickly outdate the technical parameters of a particular study (e.g. transmission delays are overcome, small cameras are available at low cost, codecs are available as software solutions, etc.). I believe that it is important to observe to what extent technology and spatial design have been integrated in these studies. To behave and interact 'naturally' in a research lab is of course very different from daily interaction with remote work colleagues in a mediated workplace, especially one that is designed as an architectural extension, where the overall design and furniture in one location is repeated – extended – to the other location.

Researchers such as Heath & Luff (1991) and Rutter et al. (1984) have shown that nonverbal behaviours do not have the same performative impact in mediated interaction as they do in conventional human interaction, which implies that some of the subtleties of nonverbal communication were lost in the former. Although a speaker could monitor the actions of the person with whom s/he is interacting, Heath et al. noted that "the resources upon which a speaker ordinarily relies to shape the ways in which a co-participant listens and attends to the talk appear to be interfered with by the technology" (Heath et al. 1995: 174).

These studies were conducted around the early *Media Space* projects at Xerox EuroPARC, where very limited attempts to integrate technical equipment with spatial design were made. Their explanation for the interference was that the visual conduct of the other person was portrayed on a monitor, which distorts movement, as well as "the relative weighting of different aspects of an individual's conduct" (Heath et al. 1995: 174; cf. Heath & Luff 1992).

Fullwood (2006) reported a study based on a simple mind-reading task in which participants completed a series of tasks in pairs, either face-to-face or via video-mediated technologies. After completing each task, participants filled in a questionnaire designed to assess how much they liked and how intelligent they believed their partner to be. The results showed that participants rated their partner more favourably, both in terms of likeability and intelligence, when the task was completed face-to-face as opposed to video-mediated. Fullwood comments that the result may be a consequence of the attenuation of visual signals, in particular gaze, which has been shown to be important in impression formation (cf. Larsen & Shackelford 1996, which indicates that individuals who make less eye contact are regarded as being less intelligent).

Several other studies that have touched on the importance of gaze in social interaction are worth mentioning here. Storck and Sproull (1995) have argued that lack of direct eye contact results in less positive impressions, with individuals often being viewed as unfriendly in mediated interaction (Cf. Kleck & Nuessle 1968). Other researchers have stressed the importance of gaze and mutual gaze in portraying nonverbal signals in mediated interaction (see e.g. Monk & Gale 2002; Angiolillo et al. 1997). Fullwood and Doherty-Sneddon (2006) advised users to look into the camera to mimic mutual gaze and showed that this had a positive influence on one particular function of eye contact: to improve the recipient's memory of verbally communicated information. Moreover, Derrer et al. (2006) have suggested that users make initial face-to-face contact before any video-mediated interaction takes place, in a study which showed that such initial contact improved impressions of interviewees and enhanced trust building (Rocco 1998). More recently, software solutions have developed which adjust gaze to enable mutual gaze (Gemmel & Zhu 2002).

MUTUAL GAZE IN PRESENCE DESIGN

The attempts to achieve mutual gaze, illustrated by design examples, as well as those instantiated in art and architecture during the 1960s and onwards, may be compared with a parallel technical development to which architects appear to have contributed much less.

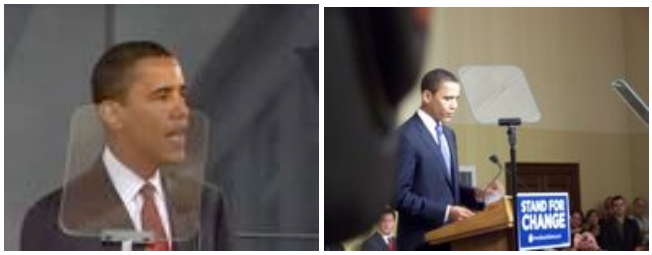
AT&T's first prototype of a videophone, called a 'picturephone', was publicly demonstrated as early as 1964 at the New York World's Fair. Several demonstrations took place at world fairs and Disneyland, where expanded telephone booths were set up as places where one could go to place a call on the picturephone. Bly et al. note that the picturephone was based on the paradigm of 'video follows audio':

> The booths physically positioned the callers for optimum lighting and a semblance of eye contact, simulating in a crude way the one-on-one position of a face-to-face encounter. The callers would not actually have the opportunity to place a call to someone they knew but would wait in line to talk with other callers who happened to be in the other booth. (Bly et al. 1993: 30)

Michael Noll, a former employee at Bell Labs, has argued that in spite of large investments in their research, development and implementation, attempts to implement video technology have resulted in a series of failures (1995). For example, at the height of the energy crisis in the mid-1970s, AT&T installed public, two-way videoconferencing facilities in a number of major cities across the United States. According to Noll, the rooms were well designed and extensive video graphics were implemented, but usage remained low, even when the service was offered for free. He recounts a similar experience in the UK Post Offices, which promoted a 'public room video conferencing system' around the same time, called 'Confravision'. Furthermore, the US Department of Health, Education and Welfare funded trial attempts of video telemedicine in the 1970s, employing technologies such as AT&T's picturephone system at Bethany/Garfield Hospital in Chicago (Noll 1995: 22ff).

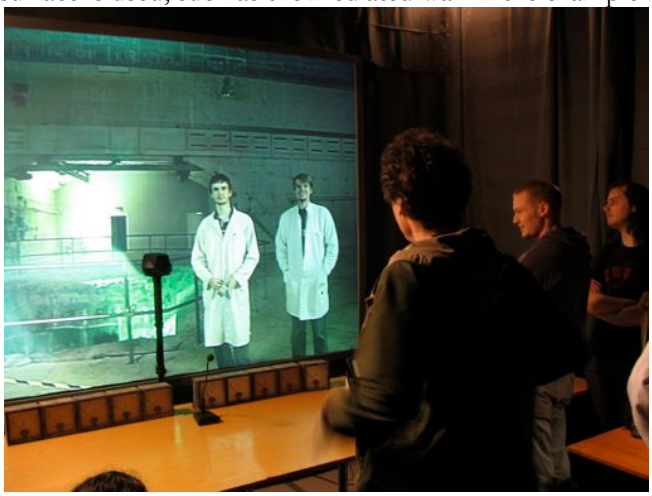
119. Stanley Kubrick's film '2001: A Space Odyssey' features a 'picturephone'. Michael Noll modelled this on the original 1960's prototype developed by AT&T (Noll 1995: 96).

Although not many have been implemented in commercial video-conferencing products, a wide range of solutions that specifically enable mutual gaze exist. Many are similar to the teleprompter-based designs illustrated in my examples. The teleprompter technology was patented in 1947 (Rosenthal 1947) and has since been widely used within broadcasting and television to allow, for example, news readers to look straight ahead, rather than looking down, while reading a text aloud. The original usage thus displayed text in front of a news reader, in such a way that a camera could still capture the news reader frontally.



120. President of the United States, Barack Obama, frequently uses an application of teleprompter technology as he addresses his audience.

In video-mediated design, images rather than text need to be displayed in front of a person. Mutual gaze is achieved when the party at each location looks straight into the camera eye. This is made possible when a camera is placed at eye-level in front of a video image which displays the person in the remote location. Such a set-up may seem inconvenient if a large camera is used, but is easily achieved. In the case that a large mediated surface is used, such as the mediated wall in the example below, the camera is less noticeable.



121. In this prototype, the camera-stand is visible and located at approximately the eye level of adults. It causes some inconvenience, since it partly covers the person in the remote location. However, it effectively establishes a spatial extension of one work environment to another, as in this example where the person (sitting) can remotely monitor functions in another space, as well as interact with a person in that remote location. In this case, back-projection was used to enable a large mediated wall, displayed on a matted plexiglass panel. (from the 'Relocation of Control Room' design prototype 2008)

Most effective, therefore, is to use teleprompter-based solutions, which allow the camera to be hidden, and where mirrors are used to create a reflection, so that the camera is right in the line of sight. This is the foundation for the design concept my colleagues and I have developed to enable mutual gaze (Cf. the photo that introduces the current chapter and illustration 13 in Chapter 1). In the example below, we used a conventional coated window glass as 'beamsplitter'. Placed vertically, at 45° to the camera lens, it provides sufficient reflection to enable the camera to capture the person at eye level.

122. In a teleprompter-based design, such as shown here in the 'Mediated Museum' design example, the viewers may look at each other, without needing to consider where the camera is located. A close approximation of mutual gaze can be obtained if the two parties use a similar arrangement. In this design prototype, two cameras at two different heights are hidden behind the curtain to the left. The heights were selected to enable children as well as grown ups to experience mutual gaze. The sheet of glass used to reflect the cameras is placed vertically at 45° before the displays, but is hardly noticeable to the visitors. The effect of a doorframe is created by two vertical plasma displays mounted on top of one another. A wooden doorframe forms part of the design, and produces a sense of 'an open door' to the audiovisually extended space. ('Mediated Museum' design example)

Teleprompter-based designs are frequently referred to as 'beam-splitters', 'half-silvered mirrors', or 'semi-transparent mirrors', because of the coated sheet of glass which is incorporated. Video cameras are, however, light sensitive and a coating may negatively affect the image quality if the camera is required to film through the glass, such as in the example below, taken from the *Remote Affinity* project (2004). Here, the cameras were placed at eyelevel behind the glass. Tilted to 45°, the glass enabled a reflection from the displays, which were placed horizontally, as part of the table-top. My colleagues and I experienced that the coating affected the cameras and later chose designs where the camera need not film through the glass.

123. Here a slightly different design concept is used. Conventional TV-monitors were placed horizontally (seen resting as an extension of the desktop) and reflected upward onto a semi-transparent beamsplitter placed at 45°. The camera was placed behind the beamsplitter, which had a special coating that allowed the camera to capture the person through its glass, at an approximated eye-height of an adult person. ('Remote Affinity in the Archipelago' design example)

124. As opposed to the previous example, the camera used in the 'Mediated Unemployment Services' was hidden beneath the desktop of this piece of furniture. Two reflective devices were used in this case. A small conventional mirror near the camera reflected what the camera captures in a larger semi-transparent mirror. A plasma display was placed vertically behind the mirror. The furniture was height adjustable, allowing also disabled persons to use the remote meeting-place. (Furniture designed for the 'Mediated Unemployment Services')

The latter furniture design can be compared with recently available commercial products, such as Cisco's mediated reception desk, shown below. The fixed camera above the remote receptionist will however not support mutual gaze.

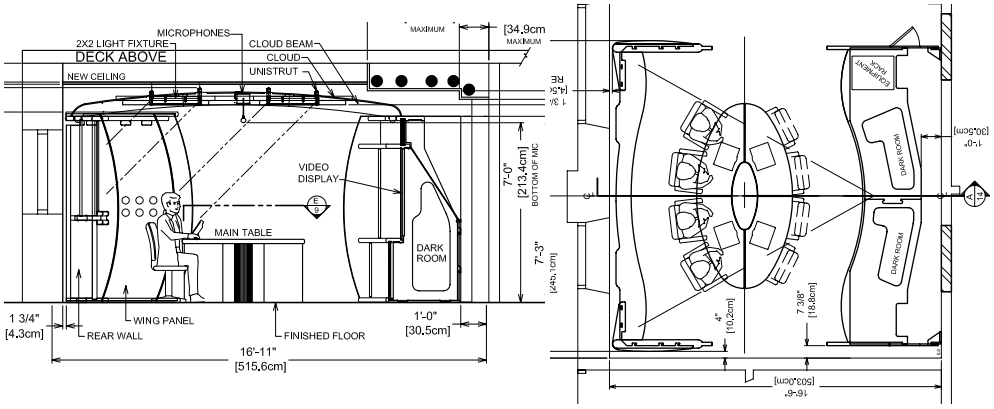
125. Cisco's expert-on-demand solution. (Cisco Systems 2009)

An example from Tandberg's video presence *T3* is similar to Cisco's design solution, where the camera is placed above the display, which means that the remote parties will experience that they are gazed upon at chest-height, and not at eye-height.

126. Meeting in Tandberg's T3 Telepresence solution. In April 2010, Cisco System's acquisition of Tandberg was announced. An adaptation of the products shown here can be expected. (Tandberg 2009)

With few exceptions, the available videoconferencing and 'immersive meeting environments' on the market (e.g. Cisco, Tandberg and Polycom-Videra) fix the camera above the display. In Polycom-Videra's *Real Presence* concept, featured below, a back-stage space used for back-projection provides sufficient space for reflection, while a small hole in the display surface allows the camera to capture sitting participants at eye-height, which yields a mediated space in which the sense of a shared space is reinforced.

127. Cisco's 'TelePresence System 3200'. (Cisco Systems 2009)



128. Section and plan of Polycom-Videra's 'Real Presence' concept, as proposed for a remote meeting space at KTH, November 2008. Drawings received from Janne Lauanne, Videra Oy and Darren Sims, Polycom UK (Polycom-Videra 2008).

129. Polycom-Videra's 'Real Presence' concept. A small hole in the centre of the display provides 'seamless' division between the two remote locations, allowing the camera to capture participants at eye-level. (Videra Oy 2009)

130. Digital Video Enterprise holds several patents for teleprompter applications that enable mutual gaze. Here, a telepresence podium serves a remote lecturer who is displayed onto a coated sheet of glass, located in a lecture hall. The side view shows how back projection is used. A mirror is used to reflect the captured image onto the glass. Left: from the website of Digital Video Enterprise (DVE 2009). Right: as displayed at KTH in December 2009.

As noted, the need for mutual gaze was observed in the first media space and several scholars have subsequently investigated teleprompter solutions in attempts to enable mutual gaze in mediated environments (e.g. Acker & Levitt 1987; Ishii & Kobayashi 1992; LeBaron & Koschmann 2003; Bondareva & Bouwhuis 2003). Many patents, based on Rosenthal's from 1947, were filed during the 1980s and 1990s, a majority of which utilize teleprompter-based solutions to enable mutual gaze.[166]

The mirror effect and problem of picture-in picture

As discussed above, a negotiation of trust generally takes place between interlocutors in human interaction. In the process of negotiating trust in mediated interaction, a remote party

[166] See e.g. US Patent 4400725 (Tanigaki 1982); US Patent 4890314 (Judd & Smoot 1989); US Patent 4928301 (Smoot 1989); US Patent 5117285 (Nelson & Smoot 1992); US Patent 5317405 (Kuriki et al. 1992; Free Patents Online 2010).

will also seek to interpret the spatial extension. From the point of view of the user, a noteworthy difference between real spaces and mediated spaces can be mentioned here. A real space can be taken for granted because a user does not often reflect on the spatial extension or design of, for example, a meeting room. In the context of real space, the individual does not need to assert that the other party is present in the same location. In a mediated space, as shown by other researchers (e.g. Nevejan; IJsselsteijn), the negotiation of trust via mediated presence relies on the user's spatial understanding of the remote space. My design examples show that the trust-building process is facilitated when a user can easily interpret the extension of space and develop a sense of shared space. This is precisely where presence design and certain spatial features play an important role, by representing the remote space as an extension of real space.

I initially stated that a point of departure for mediated interaction is that a user always finds her/himself in a real space, and consequently will interpret a spatial extension from this perspective. As shown in my examples, certain design features can be said to strengthen or weaken this experience, and thus have an impact on the experience of mediated presence. I have previously introduced the concept of design friction to point at the negative effects potentially imposed by design. In the context of the commercial video-conferencing solutions mentioned in the previous section, I have identified the lack of mutual gaze as a potential friction. Another example of design friction is the frequent use of 'picture-in-picture' representation in video-conferencing, which I believe counteracts the experience of mediated presence. 'Picture-in-picture' is an image which is often placed in the bottom corner of a display (as, for example in a Skype conversation, illustrated below) to show the local party what is depicted and thus projected in the remote location(s).

131. 'Picture-in-picture' in Skype web conferencing freeware. My outgoing image is seen in the bottom left corner as I am in conversation with Leif Handberg.

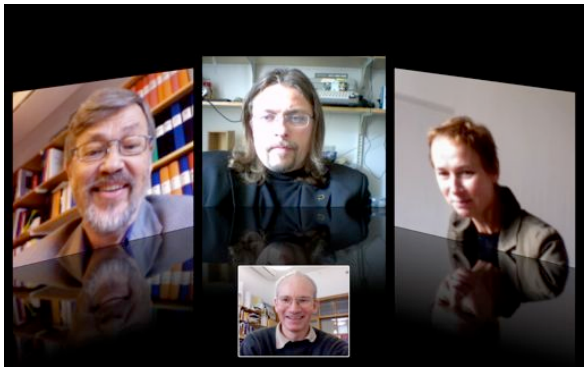
My colleagues and I mostly avoid this function, if we can, for the primary reason that it is counterproductive to dialogic interaction. It also works against the presence designer's attempt to establish a spatial extension. I will explain why.

Arguably, picture-in-picture is used to ensure that one is placed within the camera's view and thus visible to the remote parties (or in the shared mediated space, to use my own term). However, when interacting in real spaces, we do not normally see ourselves, unless, of course, there is a mirror nearby. Dialogic interaction, one could argue, is created through one's focused attention on the other party, and less on one's own appearance. In effect, the picture-in-picture makes us aware that there must be a camera somewhere and that what we see is a depiction of a camera view. Is it a good or a bad thing that we are made aware of the fact that we are being filmed?[167] It is, I believe, very important to ensure that users

[167] Video-mediated spaces do not necessarily (or automatically) involve recording the interaction. Mostly, the primary aim is to enable interaction in real-time, and not time-lapsed recordings. With the exception of *Atwood in Norway*, none of the examples discussed here have produced recordings. Certain time-limited film-clips were made for our own project documentation.

understand that one space is extended to another, but this can be done in other ways than by picture-in-picture. In a real space, if a person is not heard, or perhaps obscured by poor lighting, it is likely that one will ask the person to speak up, or request better lighting. The same occurs in mediated interaction, at least once users are accustomed to mediated spaces. My design examples also illustrated different ways to use architectural elements to invite a user to find the right position by, for example, a bar.

Oddly, Skype's presence designers have decided that the picture-in-picture in their display is a reflection and not a representation of the image as seen by other parties. This produces a sense of spatial confusion. In contrast, Tandberg's video-conferencing products provide a picture-in-picture that is not reflected. Different suppliers take different considerations into account when designing these features. Another variation of the picture-in-picture is seen below, in a screenshot of Apple's iChat interface. From looking at the current variety of such arguably spatial features in presence technologies, it is clear that presence designers can have an impact on the way we understand a remote extension and perceive each other.



132. Apple's web conferencing freeware 'iChat' provides a spatial environment around a reflective surface, as seen in this four-party meeting. From left to right: Nils Enlund, Alex Jonsson, Gullström. Below: Leif Handberg, from whose computer the photo is taken.

In real space, it would not matter very much if a mirror were placed before me while I was in conversation with someone. Possibly, I would take a look at my appearance now and then, but it is hard to say that a mirror would negatively impact the interaction. In a mediated space, however, such a mirror (or picture-in-picture) can detract from the illusion of a spatial extension, because it establishes a surface rather than a three-dimensional extended space. It also generates an odd feeling of self-consciousness: why am I depicted as part of a dialogic interaction? In the process of establishing trust, a person seeks confirmation from the remote party and attempts to ensure that the interaction can be relied upon. One could argue that the picture-in-picture becomes a distraction and thus counterproductive to dialogic exchange. As noted by IJsselsteijn (2004), it works against the "on-going construction of our sense of place" and against the depth cues that are otherwise in place. To allow individuals in mediated interaction to behave as naturally as possible is important; this is also the reason, as already mentioned, our designs conceal technical devices such as cameras, microphones and loudspeakers, which would prompt a user to feel that s/he were in a film-studio.

Frontal versus lateral forms of collaboration

The commercial videoconferencing designs above, as well as the example of the *Mediated Therapist* and the *Mediated Unemployment Services*, illustrate a focused and formal form of collaboration, where both parties are concentrated on the interaction. However, such face-to-face interaction is only one of many cooperative activities that distinguish teamwork. As previously noted, Heath et al. have stressed that such focused interaction constitutes a

relatively small part of working together, just "one amongst a diverse configuration of spatial and bodily arrangements through which personnel participate in each other's activities and accomplish the 'business at hand'" (Heath et al. 1995: 177).

Of greater importance to facilitating collaboration is to support peripheral monitoring and awareness in relation to an object or an artefact that office-workers share as they sit side by side, "continuously sustaining a shared focus on an aspect of a screen or paper-based document, such as a section of an architectural drawing" (ibid.: 176). Hence it is not necessarily important to see what another person is seeing, "but rather seeing the other in relation to what he or she is looking at and doing" (ibid.: 178).

Working side by side

Aiming to explore how mediated spaces specifically support similar informal aspects of collaboration, Leif Handberg and I have developed teleprompter-based design prototypes for different informal social settings and learning contexts, such as *Remote Mingling at a Conference*, the *Mediated Pub*, and the *Mediated Museum*, which will be described in the course of this chapter.[168] Our ambition has been to integrate spatial and technical design, and to use larger projection surfaces in such a way that users naturally become part of a continuous spatial extension, so that they can address the 'business at hand' without thinking too much about how it has been made possible.

I have previously discussed the difference between informal and formal interaction. I propose it is also helpful to distinguish between designs that support lateral and frontal interaction, awareness, or forms of collaboration.

A museum is, for example, a public space where individuals move along a path, quite independently of one another, and where artefacts are displayed in such a way as to trigger curiosity. Walking through such a setting, a visitor will be aware of a number of artefacts whilst passing, most of which will be glanced at laterally. Once a visitor has taken interest in something, s/he will turn to face the artefact frontally. In terms of mediated museum extensions, therefore, designers have experimented with lateral and frontal compositions as triggers for mediated interaction.

In the following section, we will look more closely at how these design concerns were treated in the example of the *Mediated Museum*.

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[168] The prototypes were developed as part of the Mediated Spaces Research Project (2007-09); see Appendix 2 and Gullström & Handberg 2008; Gullström, Handberg, Jonsson 2008; Gullström 2009. For earlier attempts at supporting informal mediated interaction at the Royal Institute of Technology in Stockholm, see e.g. Tollmar et al. 1998; Gullström et al. 2002; Handberg et al. 2007.

design example:
the mediated museum

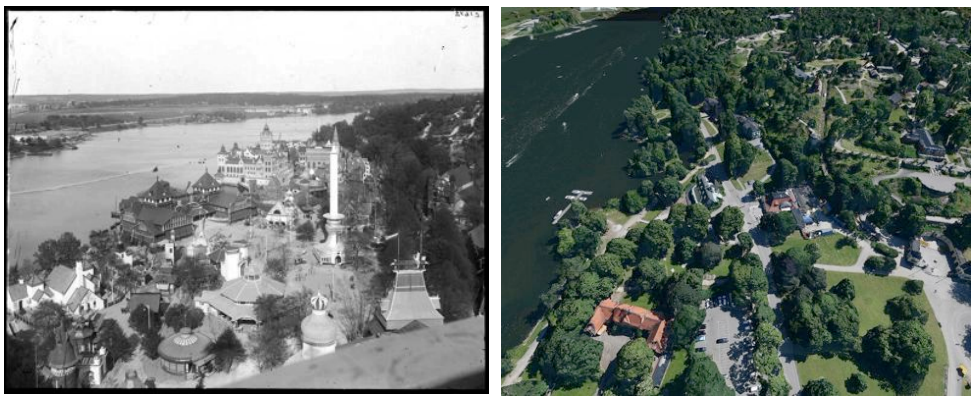
133. The architectural extension which enabled museum visitors to follow an excavation process and interact remotely with people at the excavation site, referred to as a mediated window or glass door. The excavation involved searching for remains and traces of the renowned Art and Industry Fair that took place on Djurgården, Stockholm in 1897. An exhibition about the 1897 fair was set up inside the Museum of National Antiquities.

In 2008, my colleagues and I designed a mediated museum extension for a pilot study in which a Stockholm museum was extended to an archaeological excavation site. This installation allowed visitors to interact and to be guided remotely in real-time through a mediated window or glass door. This project explored how a mediated architectural extension could facilitate access to a cultural heritage site by enabling the experience of *remote presence*, and how such new forms of communication between a museum and its visitors could inform cultural heritage research processes.[169]

[169] The pilot study was carried out as part of the research project, 'Remote Presence to Research Heritage Environments' (2006-08), as a basis for a continued research project 2009-11, which is funded by the Swedish

The excavation concerned the remains of a renowned Art and Industry Fair that Stockholm hosted in 1897. Attracting 1.5 million visitors over a period of six months, it was one of the largest-ever public attractions in Sweden. The fairgrounds, located in a park area called Djurgården, constituted a pavilion city specifically designed for the event. In both form and content, the displays of industrial, societal, architectural, and artistic innovations expressed high expectations and ambitions for a modern Swedish society.[170] The fair is well documented, but very few visible traces remain on the site today. Due to its importance, the large number of visitors, and widespread souvenirs, the 1897 fair still reverberates in public memory. This part of Djurgården was frequently the setting for cultural events even before 1897, and still is today. It is a very popular recreation area, but contrary to what its historical importance would imply, it is not recognized as a cultural heritage site. During two weeks of the summer of 2008, a part of the 1897 fair site was therefore excavated as part of a collaborative process involving researchers at the Royal Institute of Technology in Stockholm, archaeologists, staff from the Swedish Museum of Antiquities, and the general public. Our mission was to explore ways in which remote presence could inform cultural heritage processes and the development of museum practices.

134. The entrance to the Stockholm Art and Industry Fair in 1897 and the same view today.[171]



135. The aerial view from 1897 shows the extent of buildings constructed for the fair. The photo is taken from the top of one of the minarets of the tallest building, the 'Industry Pavilion', seen above. This and most other buildings were taken down after the fair closed. An aerial view today shows that few traces remain. The medieval replica on the artificial island, the focus of our excavation, can be seen to the left of the obelisk in the left picture. Today, the island is covered by greenery but noticeable along the footpath in the picture on the right. (photo right: Hitta 2010)

National Heritage Board: 'Cultural Heritage Processes and Remote Presence'. See Appendix 2. As designers, I here refer to Gullström and Handberg, Senior Lecturers at the Royal Institute of Technology (KTH), with assistance from Stefan Axelsson, Fredrik Hansen and Jacob Waller, diploma students in media technology.

[170] See e.g. Ekström 1994; Ekström et al. 2005; Sörensen 1999; Hildebrand et al. 1897; Folcker 1899.

[171] Unless otherwise specified, all 1897 photos in this section are retrieved from the Stockholm City Museum's open archive 2009. Unless otherwise specified, contemporary photos are taken by the pilot study project group and the illustrations are my own.

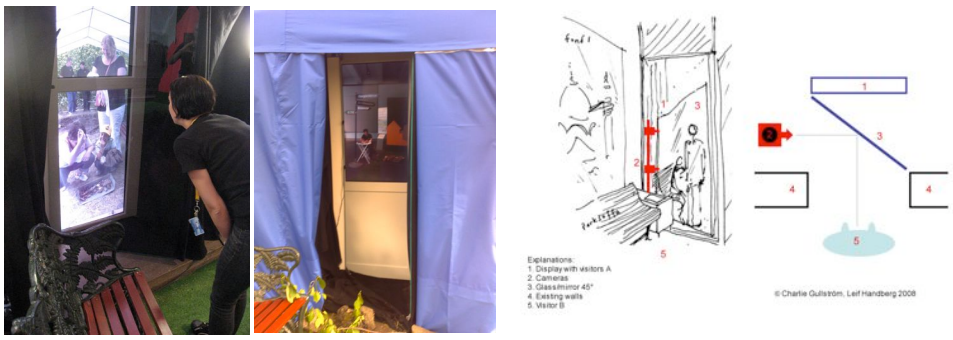
The focus of the excavation was a small island to which there is usually no access, located by one of the main footpaths in the park. At the 1897 fair, a medieval replica was built here which invited visitors to experience an unspecified medieval atmosphere. Today, no visible traces from 1897 remain. We invited passersby to participate in an archaeological excavation guided by professional archaeologists, and to contribute oral histories and objects relating to the fair. Intrigued by large photographic displays and an outdoor exhibit about the fair, people stopped to ask questions and many took a closer look. A temporary pedestrian bridge enabled people to join the excavation. Those who did were made aware of a mediated spatial extension to the Museum of National Antiquities, via a mediated window, or glass door placed adjacent to the excavation site. This installation made face-to-face conversations in real time possible and extended visitors' mediated presence between the museum interior and the remote location.

136. The 1897 medieval replica 'Olde Stockholm' (left), of which few traces remain today (centre). The former constructions on the small island are visible on the illustration (right), which recreated a medieval atmosphere. The exhibition designers were not preoccupied with authenticity or chronology; they simply wanted the visitors to sense that they were walking into the Middle Ages. A collection of spectacular buildings originating from different well-known medieval towns was constructed in half-scale. They were simple wooden constructions clad with plaster and painted (Hildebrand et al.1897; Folckner 1899). Actors dressed up in medieval clothes and staged live scuffles and abductions (Sörenson 1999). You could also take a drink in the old tavern or, in stark contrast to the medieval setting, witness one of the first shows of public cinema in Sweden. As noted in Chapter 2, people were able to view short films from events at the fairgrounds on the very same afternoon that they had taken place.

Inside the Museum of National Antiquities, a corresponding glass door was designed and integrated into the exhibition about the Art and Industry Fair. Approaching what can be referred to as an 'opening' in the wall, a mediated window or glass door, museum visitors would meet passersby and archaeologists face-to-face, and were able to discuss and closely follow the activities at the excavation site. The verticality of the opening, its form and wooden frame, suggesting a glass door with a horizontal bar, contributed to the architectural extension and experience of remote presence. Given its design, the analogy of an open glass door is perhaps more adequate than a window. The measures of the door (height 2 m, width 0,9 m) allowed visitors to meet face-to-face, to closely follow what was going on at ground level as well in the surrounding landscape, trees and sky. To avoid direct sunlight and optimize the light conditions for the cameras, black velvet textiles were used to frame the door. As seen in the photos below, one would 'stand in a doorway' or 'speak through' the glass door, which appeared to have been 'left open', since the design that enabled mutual gaze included a sheet of glass placed at 45° before the opening.

No ticket or prior booking was needed to visit the interior exhibition, the excavation, or to participate in the digging. Many of those who attended the excavation were passersby, joggers or pedestrians, who had no prior interest or intention to visit a museum. Nevertheless, several took interest and paid a visit to the museum later. As a result of our project, both the museum and the cultural heritage site received many spontaneous visitors. In addition, a number of visitors participated in the activities remotely: almost 5000 people visited the excavation site in person over the two weeks, and about 2000 visitors participated remotely, from the spatially extended museum interior.[172]

[172] The excavation site was within walking distance (10 minutes) from the museum and the project was partly carried out in the interest of attracting more (and new categories of) visitors to the museum. The Museum of National Antiquities later credited the project for an increase of the total number of museum visitors recorded in

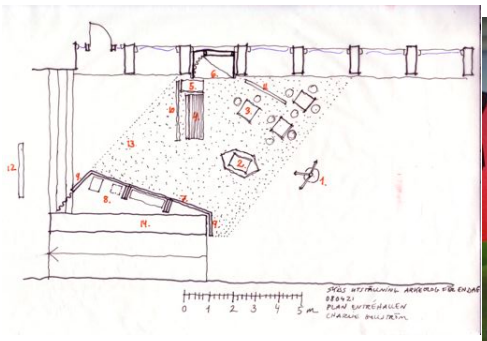


137. The mediated door's resemblance to a real door was created using a wooden frame that shielded the three vertical 46" projector displays (two inside the museum, one at the excavation site) . The 'beamsplitter', glass at 45°, could be interpreted as a glass door which had been left open. Aiming to show that remote presence could be achieved at limited cost, the designs were based on commercially available audiovisual communication equipment of good quality (not the most exclusive), and a beamsplitter design concept enabling eye contact which was previously developed and tested. Designs by Gullström & Handberg.

138. Left: The exhibition area in the museum before the event. Centre: My proposed exhibition design, with a backdrop depicting the 1897 Art and Industry Fair behind the green park bench, which was placed in such a way as to promote a spatial extension to the excavation site. Right: the final exhibition inside the museum, with large backdrops, providing a shield against the strong daylight. The extension towards the excavation site is surrounded by black curtains on the right. Several museum visitors later mistook our mediated window-door for a real door, since there were several other openings to the museum courtyard.

139. The exhibition design included outdoor features that served to connect the two spaces. For example, we included a grass-green carpet, a park bench and road signs, identical to those used on the outdoor site. To the left, my sketch of the planned extension of the park bench which would enable people to 'share the same bench'. Because of the chosen layout at the excavation site, we decided to place the bench so that people could face each other instead.

August 2008 (17667 visitors in comparison with 10957, in August 2007). This number does not include the visitors to the island, but it can be discussed under which conditions remote participation and mediated interaction qualify as a 'museum visit'.




140. Left: My proposed layout of the exhibition, where the extension to the excavations site is an opening among others in the facade. Located by the bench (no. 6 in the floor plan), the mediated glass door enabled museum visitors to see and talk with those attending the excavation. Our observations showed that the combined technical and spatial design supported the experience of remote presence and that mutual gaze played an important role.


141. Our idea of how to attract passersby is visible from my early sketches. From one of the main footpaths on Djurgården, a popular recreation area for tourists as well as Stockholm citizens, large signs and projections triggered curiosity about the activities on a little island to which there is usually no access. The photos displayed large buildings that once stood at the site, most of which were taken down after the fair closed.

142. A temporary pedestrian bridge enabled people to take a closer look at the goings-on. As a visitor stepped onto the island, one of the archaeologists would approach and inform about the activities. This soon developed into a 'guided tour' of three sites: (1) the large poster displaying the square and buildings from which we were looking for traces (seen here); (2) the actual excavation site; (3) the mediated extension to the museum.



143. Using different visual media, we caught the interest of passersby, many of whom were jogging or walking. Intrigued by our large displays and an outdoor exhibit about the 1897 Art and Industry Fair, many stopped and asked questions. The fact that so many buildings once occupied the small island intrigued visitors. Researchers and museum staff were at hand to answer questions such as, "Was all this really constructed here? Why were all these buildings demolished after the event? Are there any traces left on Djurgården today? What have you found whilst digging?" The photo at right shows the tower by the square, around which the excavation was focused.


144. A tent with an outdoor exhibit was place along one of the main footpaths on Djurgården, and we took turns standing there to invite people to visit the island. As an architect, I would discuss the original fairgrounds and the buildings that were no longer there.


145. The extension to the museum was only one of many activities at the busy excavation site, where we also had posters, books and other learning sources available. Over two weeks, approximately 5000 people visited the island, 2000 museum visitors participated remotely, 2000 people followed our blog and about 50 individuals contributed oral histories and souvenirs. (approximated figures from the Museum of National Antiquities)

Remote guides

The active participation of archaeologists, researchers and museum staff was an important feature of the research and design process. At all times, between six and eight archaeologists, researchers and museum staff were on hand in both locations, throughout the duration of the two-week project. Several of us, in effect, developed the role of 'remote guide' in the course of the project. From either side of the mediated glass door, we would engage people in conversation by talking about the excavation, the findings, and the Art and Industry Fair,

rather than about the mediated glass door.[173] The 'guided tour' that developed next to the excavations site included a conversation through the window, sometimes prompted by museum staff or researchers.

There was a noteworthy difference in terms of the ongoing activities in each location. To museum visitors, the noise and visible movements of people digging in the outdoors triggered curiosity and directed their attention away from the interior and towards the exterior.

146. Curiosity about the remote activities often provided enough reason for visitors to interact across the two sites. The view from inside to outside appeared to be the more compelling of the two. Our design decision to place the findings box on the 'threshold' between the museum and excavation site after a few days contributed to the directed gaze.

[173]Depending on their individual expertise, each researcher would contribute archaeological, architectural, or historical perspectives in such mediated interaction. Those of us who had worked on the spatial and technical design agreed to participate as active observers prior to the event. We took turns and stood near the window/door, engaging visitors in conversation about the excavation and its context, rather than on the technical concept. We would later discuss our experience and observations amongst ourselves. The reflections and observations presented here are based on discussions with the other KTH researchers, as well as interviews with the participating archaeologists and museum staff.

Technically, it was a challenge for the design team to work out of doors with demanding and varying climatic and lighting conditions during the two weeks the installation endured. At the excavation site, a blue tent was used to shield the required equipment and visitors would look 'through the opening of the tent door' as they looked into the museum. Every evening for two weeks the mediated glass door was dismantled, and reassembled the next morning.

147. The role of 'remote guide' emerged as part of the process. To enable communication in real-time and minimize delay, a direct fibre link was set up between the museum and the excavation site.

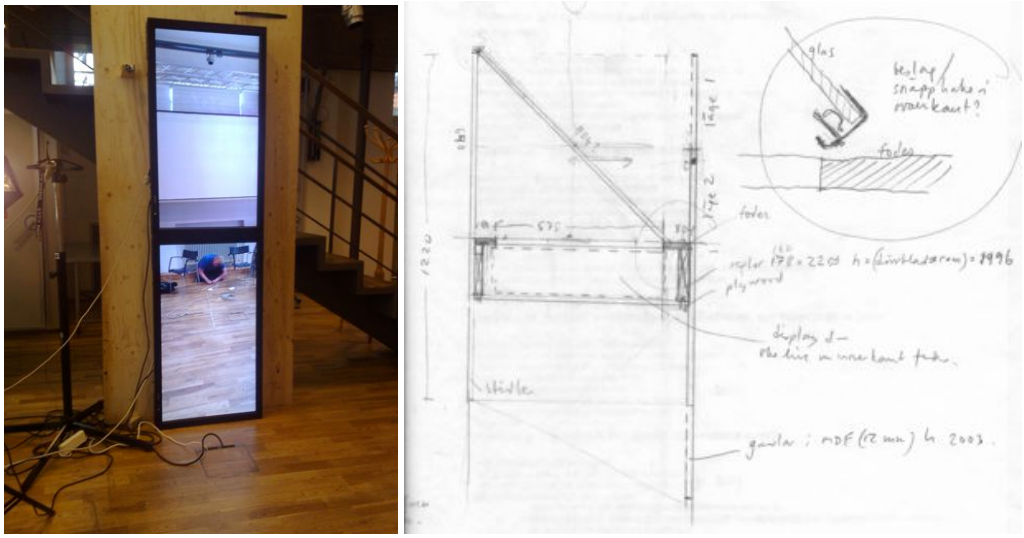
148. The ability of our design to facilitate mediated presence was noticeable when visitors engaged in close interaction. Left: a group of school children visited the museum. Centre: I am discussing the project with Swedish Minister for culture Lena Adelsson-Liljeroth at the excavation site and Li Kolker, a pedagogue at the Museum of National Antiquities. Right: Li guides a young visitor remotely.

Design prototypes

Several design observations relate to the prototyping process, during which we attempted to make as large a wall opening as possible, but found that a door-sized opening would ensure the best conditions for mediated interaction in this context. The reasons were budget-related (we had limited budget and time), climate-related (it was difficult to predict the potential negative effects of the August sun and rain, and theft-related (we had no means to supervise the excavation site at night time), but primarily design related. As part of prototyping, we explored different qualities of matted acrylic glass onto which we planned to project large images using back projection. Thinking it would be adequate for the outdoor solution, and that we would only need to dismantle projectors and cameras at night, back-projection appeared to be an ideal solution. Although this prototyping proved informative to our subsequent work, we abandoned back-projection and opted for displays, shielding the seam of the two with a wooden frame. This created a design reference to a door, as seen in the description of the project above.

One benefit of working outdoors as opposed to indoors is noticeable in the photo of the design prototype below. In the prototype, two displays are placed on top of each other in order to create one seamless representation of a remote location. Each display represents what is captured by a video camera at the remote location. The two cameras are aligned but placed at different heights (approximately eye level for an adult and child, respectively). To synchronize several cameras and displays, yet adequately reproduce one picture without

distorting the perspective, is a challenge. The soft curves and subtle features of the outdoor park area obscure these problems, while the protruding rectilinear qualities of indoor environments make the distortion quite obvious, as seen in the lower display in the image below.



149. The photo from our prototyping exposes the difficulties in combining two cameras placed at different heights in such a way that a seamless representation of the remote location is provided without distorting the represented view. The perspective in the lower half is distorted, which is especially noticeable on the floor and horizontal framing of the room. In comparison, the subtle and irregular curves of nature make this less noticeable. To the right, one of my first sketches after the decision to design a mediated 'glass door' using displays rather than projectors. We needed a construction that would be easily disassembled and reassembled.

The concept of shared mediated space

Much can be said about the choices we make as designers; the smallest of decisions in a design process may determine whether a solution will be successful. A handbook in presence design could be considered a useful contribution of this thesis, since my accounts of the design processes have been limited to research-through-practice reflections of presence design as architectural design. I want to mention two design concepts that relate to the examples above, which concern size and selection of views onto a remote location: *shared mediated space* and *offscreen space*. Both have been mentioned earlier, but are illustrated below, since it was my experience of the *Mediated Museum* project that allowed me to consider their value to an extended architectural practice.

Although the final design of the 'opening in the wall' was relatively large in the *Mediated Museum* – the door inside the museum was the size of a normal door – participants nevertheless expressed a wish to 'see more'. It was apparent, possibly due to the many activities and the exciting sounds of the digging site, that people wished to know what was going on outside of what was visible in the camera's view. It is from such observations that I have developed the concept of *shared mediated space,* which also allows me to briefly address the issue of how to adequately represent mediated spaces in architectural drawings. In considering a conventional representation (such as the map below), we can foresee the difficulty in representing the mediated extension to a museum.

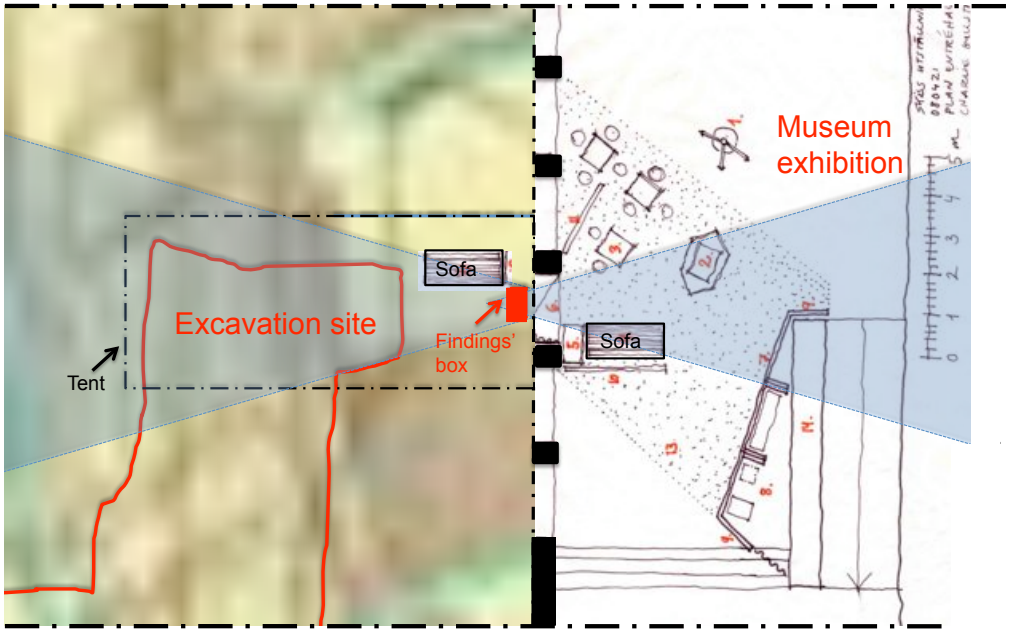
150. A map of the fairgrounds, from 1903, after many buildings were taken down. The pedestrian bridges to the artificial island are still in place but were taken down a few years later. (Swedish Mapping, Cadastral and Land Registration Authority 2008).

151. An enlargement of the part which contained the 'Olde Stockholm' replica. In blue overlay: the contemporary outline and height curves of the island. The basis is a map from 1897, drawn by the architect of 'Olde Stockholm', Fredrik Lilljekvist. (Adapted from Hildebrand et al. 1897)

Below is an attempt to include the extension to the interior space of the museum in the map above, in 1:1 scale. It is represented as a white square with unclear boundaries. The blue cone depicts the scope of the camera lens, as distributed horizontally in the floor plan. As noted in the example of the *Mediated Therapist*, the section of shared mediated space is also necessary to adequately represent the concept of shared mediated space.

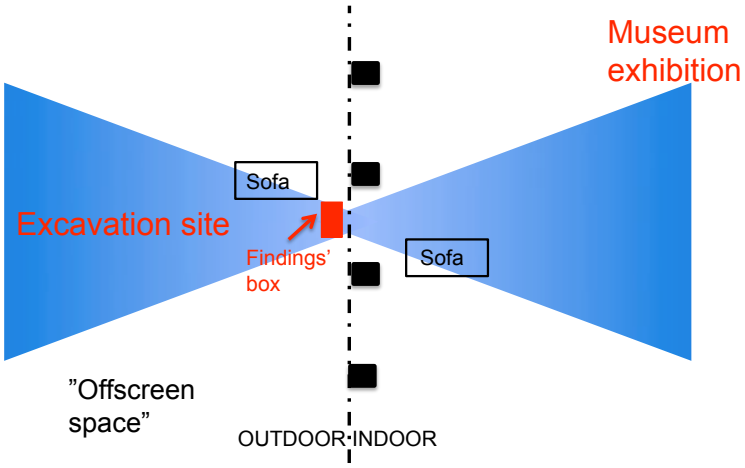
152. This is an enlargement of the same map with an outline of the excavation area (in red). Inserted, the part of the museum floor plan which was visible to the visitors at the island, which denotes the concept of shared mediated space (blue triangle).

Further enlarged, we begin to see how the two spaces relate. However, while the opening in the museum façade is noted, the equivalent opening of the blue tent is by necessity lost in this attempt to represent the mediated architectural extension.



153. The findings box placed 'on the threshold' is seen above. I have marked the location of the park benches on either side of the opening. As in the previous drawing, the shared mediated space is represented by blue triangles.

It is interesting to depict the boundaries of offscreen space and shared mediated space, so as to see the montage of spatial design features that are thus visible to a user. Schematically illustrated below, it is this relationship which is key when designers ask themselves, 'Is the extent of the bench visible to the two parties? Could it be placed in a different angle? Can that back-drop be slightly moved to the right?' Such considerations, which concern the relationship between offscreen space and shared mediated space will, to a certain extent, determine the user's experience of a spatial extension.



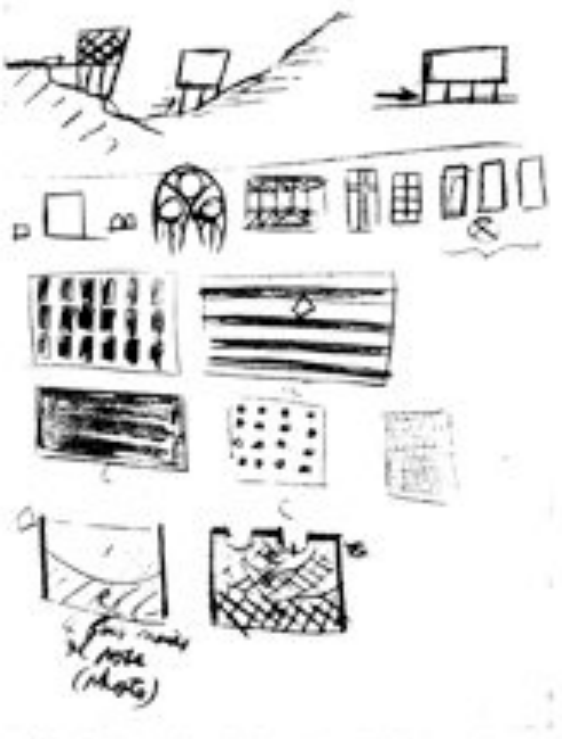
154. A schematic illustration of shared mediated space and offscreen space between the two locations.

The representation of mediated spaces is a topic for continued design-led research. While in the above, I provided schematic floor plans to denote shared mediated space, it would be beneficial to use more advanced tools to represent remote spaces, which could illustrate the perspective of users in respective locations. What would, for example, an adequate architectural representation of the *Remote Affinity* project look like? How would a drawing depict the three locations involved in mediated interaction?

chapter 6 mediated windows, framing and transparency

6

INTRODUCTION



155. Window sketches used by Le Corbusier as part of the lecture "Les techniques sont l'assiette même du lyrisme" (Techniques are the very basis of poetry) which he gave on October 5, 1929 in Buenos Aires (Le Corbusier 1930: 55).

I have, on a number of occasions, referred to the architectural extensions we have designed as mediated windows, glass doors and wall openings. Le Corbusier once proposed that the history of architecture is the history of windows. I will use this premise as a point of departure for this chapter. Here I ask: is it appropriate to say that these are new architectural elements that can extend our conception of the discipline of architecture?[174]

Architectural design is conventionally executed by 'brick and mortar', but it can be argued that new building materials are developing everyday, some adapted from the field of media and communications. It is, of course, impossible to say whether masters of modern architecture, such as Le Corbusier or Mies van der Rohe, would have treated a mediated window as a building material, but concepts such as *framing* and *transparency* are at the root of this dilemma. We may thus turn to art and architecture to discuss how these concepts have been treated previously. Delimiting this study to my own design practice, which explores video as a 'building material', I seek to understand how spatial and aesthetic conceptual tools derived from related visual practices can be applied to presence design. In the following section, I outline the significance of windows in architecture and art, the primary function of which is to establish the relationship between interior and exterior space. Through the concepts of framing and transparency I explore how windows have been treated in the modern history of architecture, by the likes of Le Corbusier, Mies van der Rohe, and Bruno Taut. I give a brief account of the history of glazing and discuss whether the different possible ways to represent the passage from indoors to outdoors (in art and architecture) are fully taken into account in the design of mediated spaces. This, in turn, allows me to contextualise the design example described in the previous pages – the *Mediated Museum*.

[174] An edited version of this section was published in *Footprint* no. 6, 2010 (Gullström 2010).

LOOKING AT – LOOKING THROUGH

It was in the second of his ten lectures given in Buenos Aires in 1929 that Le Corbusier related the history of architecture as 'the history of windows throughout the ages' (Le Corbusier 1930; 1991: 52).[175] Elaborating on the five points for a 'New Architecture' presented a few years earlier (1924), he proceeded as follows: "I am going to announce an outrageous fundamental principle: *architecture consists of lighted floors*. Why? You can easily guess: you do something in a house if there is light; if it is dark, you are sleeping." (1991: 52) This statement provides a connection to the example we presently examine: without light, electricity, and transmission, the design fails completely. There is neither activity nor architectural extension.

Addressing the double nature of modern glass architecture, Kenneth Frampton has pointed at the unresolved contradiction in Le Corbusier's early work, between a machine-like precision of form and finish and the crude means of realizing a building. The Villa Savoye, in Poissy-sur-Seine outside Paris, is one example where a rough concrete framing was rendered seamless in stucco (Frampton 1979: 38).

Frampton has also observed how Mies van der Rohe's work from the 1920s shows the simultaneous capacity of glass to produce complex optical effects and the ineffable (light, shadow, transparency, reflection), while stressing the material presence of a building and glass as a building material. Frampton breaks it all down to a series of polarities which characterize the use of glass: "tectonic versus stereotomic; still versus agitated; open versus closed; and above all, perhaps, traditional material versus space endlessness" (1995: 175). Where Frampton discusses tectonics, other scholars have distinguished between 'literal' and 'phenomenal' transparency in Le Corbusier's combination of architectural elements (Rowe 1976: 159ff; cf. Allen 2000: 114). For Le Corbusier, the elimination of exterior supporting walls permitted a larger surface of glazing and the use of what he called 'window walls' to seal his mechanically regulated interiors. Acknowledging that not all façades should be glazed, Le Corbusier presented four glazing strategies: the window wall (*le pan de verre*); the ribbon window (*la fenêtre en longeur*); the mixed wall (*le mur mixte*); and non-load-bearing masonry cladding (*le pan de pierre*).

In a 1973 essay, the art historian Carl Nordenfalk, specialist in early medieval art, presents the window as 'a 2000-year-old space problem in western art'. He uses well-known examples to sketch how the role of windows changes through the history of visual arts. Nordenfalk parallels the glazing technologies used by Le Corbusier and Frank Lloyd Wright with the way French artist Pierre Bonnard treats the interior and the landscape: as if it were one space where the "the passage between outdoors and indoors is free" (Nordenfalk 1973: 257). His example is Bonnard's *Dining Room in the Country* (1913), seen below. We may note that the woman is standing outside, but leans into the dining room, through the open window.

While medieval art can productively illustrate the transparent and reflective qualities of windows, Nordenfalk argues that it is only from the beginning of the fifteenth century that a window's capacity to mediate between indoors and outdoors is represented in the arts. His essay brings the role of the spectator to the fore, whereas architectural theory more often treats a window as part of an exterior skin. In the context of mediated windows, a study which focuses on "the representation of an outdoor view seen through an interior" may therefore be considered useful (1973: 233).

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[175] Le Corbusier made this reference, further stating: "Architecture is lighted floors. I demonstrate it with a series of little sketches showing the history of architecture by the history of windows throughout the ages. As I said above, the object is to carry floors on walls that one perforates with windows in order to light the interior. And this thankless contradictory obligation (to carry floors on walls that one pierces) marks the effort of builders throughout history and gives architectures their character." (Original in Le Corbusier 1930: 55; English translation in Le Corbusier 1991: 51f)

156. 'Dining Room in the Country' by Pierre Bonnard 1913. The Minneapolis Institute of Fine Arts, Minnesota.

Framing and transparency

The relationship between outside and inside is a central theme in both art and architecture, and a mediated window can be compared to earlier glazing technologies that enabled the human eye to establish a unity or extension between one space and another. Accordingly, the mediated window can be considered as an architectural element. To support this claim, I will examine the origins of glazing and the emergence of the window as an architectural element.

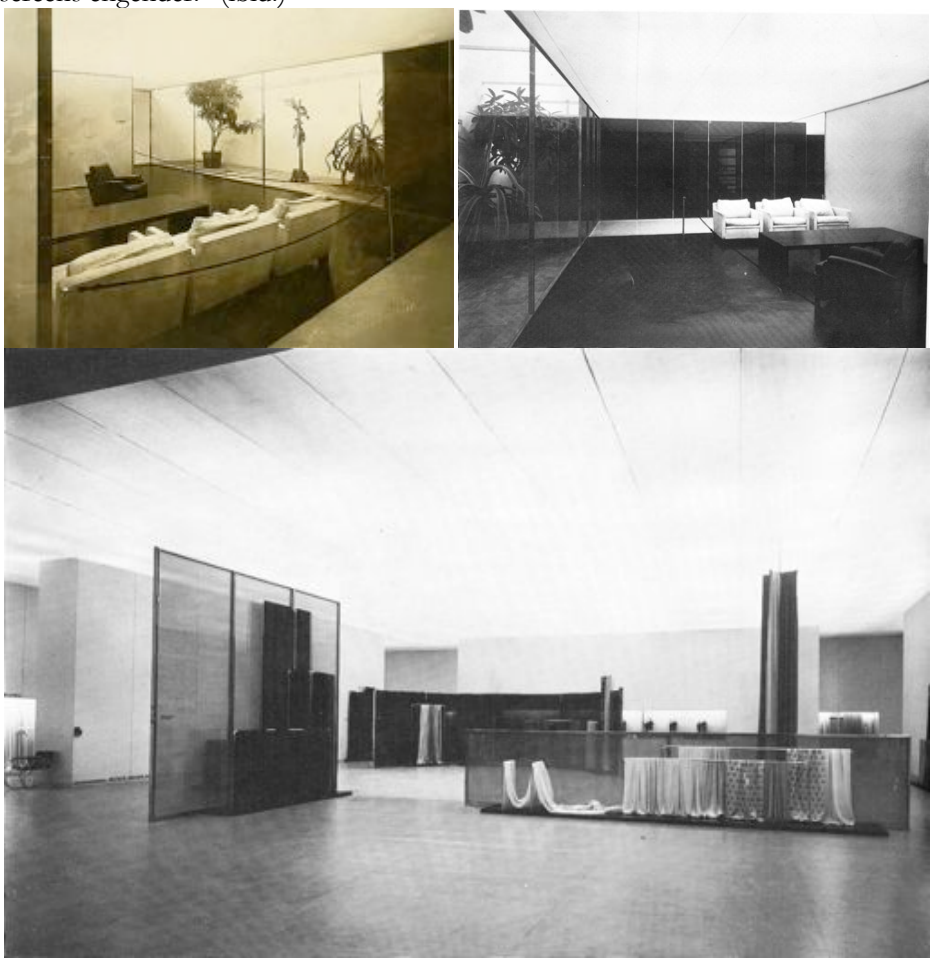
As several scholars have observed, the development of glazing technologies goes hand in hand with the implementation of glass as a new building material in architecture (Friedberg 2006; Elkadi 2006; Armstrong 2008). While framing and transparency may be useful concepts in presence design, we are looking at two different ways of achieving transparency. The transparency of a glazed window comes in the form of silicon dioxide – to which soda has been added to facilitate melting, and lime, a stabilizer against the adverse effects of water. Transparency in the case of the mediated window is achieved by means of cameras, projections and a chosen means of transmission.

Richard Lanham has eloquently addressed the concept of transparency, but with reference to hypertext and writing. Adapted to a more general theory of representation, the following passage is also of relevance to the mediated window:

> The textual surface is now a malleable and self-conscious one. All kinds of production decisions have now become authorial ones. The textual surface has become permanently bistable. We are always looking first AT it and then THROUGH it, and this oscillation creates a different implied ideal of decorum, both stylistic and behavioural. Look THROUGH a text and you are in the familiar world of the Newtonian interlude, where facts were facts, the world was really "out there," folks had sincere central selves, and the best writing style dropped from the writer as "simply and directly as a stone falls to the ground," precisely as Thoreau counselled. Look AT a text, however, and we have deconstructed the Newtonian world into Pirandello's and yearn to "act naturally. (Lanham 1993: 5)

May we refer to a mediated window as an architectural element, a new building material or glazing technology which, in the words of Frampton, has contributed to a "shift from heavy opacity to light translucence [that] had both tectonic and aesthetic ramifications" (Frampton 1995: 173)? Frampton here refers to the double nature of Mies van der Rohe's architecture of the 1920s, where the contrasting qualities of different materials become the

terms for a 'binary opposition'. He argues that glass required a skeleton frame, hence a strictly tectonic system, in order to sustain itself against gravity.[176] From his 1927 collaboration with Lilly Reich, in the Exposition de la Mode in Berlin, Mies achieved such contrast by creating 'ephemeral semitransparent screens'. Silk textiles were used which, set against the plate glass, Frampton suggests, "yielded a dematerialized aesthetic plus a constant mirroring of the interplay between the transparent and the translucent" (ibid.). Frampton discusses the paradox of Mies' achievement, in phrasing not altogether alien to our current context: "On the one hand, the necessity for a frame to support the freestanding silk or glass screens, on the other hand, the ineffable, free-floating, even illusory volumes that these screens engender." (ibid.)



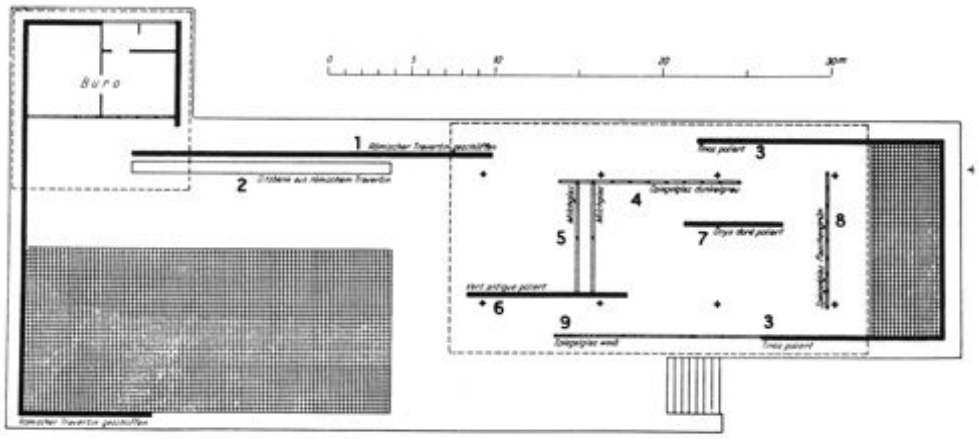
157. Two examples from 1927 to which Frampton refers, where the dematerialized aesthetic qualities of Mies van der Rohe's architecture is noticeable. Top: the living room in mirror glass, at the Werkbund Exhibition in Stuttgart. (Mies van der Rohe archive, Museum of Modern Art, N.Y.) Bottom: the silk exhibition of the Exposition de la Mode in Berlin (both designed with Lilly Reich). (Frampton: 1995: 173)

At the time, Mies argued that new tools provided a new freedom to the architect. A similar argument could be made by today's designers of mediated spaces:

> These are truly architectural elements forming the basis for a new art of building. They permit us a degree of freedom in the creation of space that we will no longer deny ourselves. Only now can we give shape to space, open it, and link it to the landscape. It now becomes clear once more just what walls and openings are, and floors and ceilings. (Tegethoff 1985: 66)[177]

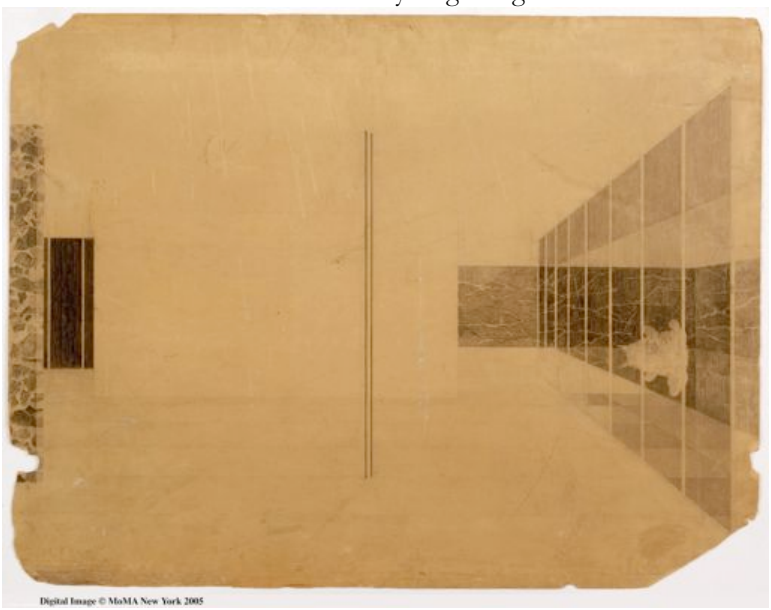
[176] Cf. the previous quote from Le Corbusier (1991: 51f).
[177] Mies van der Rohe, in his 'Address to the Union of German Plate Glass Manufacturers', March 13, 1933.

The above aspirations are well illustrated in Mies' seminal German Pavilion of the International Exposition in Barcelona in 1929. The floor plan below specifies wall materials with different reflective capacity as well as subtle shades of tinted glass.



158. The 1929 floor plan for the German Pavilion indicates reflective wall materials as follows: (1) Polished Roman travertine; (2) Bench of Roman travertine; (3) Polished Tinian marble; (4) Dark gray mirror glass; (5) Frosted glass; (6) Polished green antique marble; (7) Polished gold onyx; (8) Green bottle-mirror glass; (9) White mirror glass. (Frampton 1995: 178)

An interior perspective of the German Pavilion at Barcelona provides an excellent example of Mies' use of transparency and framing. As observed by Terence Riley: "Rather than making the glass look fully transparent, he gives the dark green Tinian marble different shadings behind the wall and to the left and right of it, approximating the visual effect of the screen of gray glass. Even the reflection of the sculpture in the pool is studiously considered." (McQuaid 2002: 70) Mies excels in the articulation of the relationship between inside and outside, but explores the material properties that allow us to see through glass, we need to look further into the history of glazing.



159. In 1928, Mies began work on the German Pavilion for the 1929 Barcelona International Exposition. In this early sketch of the interior perspective, we see the famous 'Mies column' in the centre. This design carefully renders the view through the glass wall into the courtyard, where a reflecting pool and a sculpture of a reclining figure is traced. Pencil on tracing paper. (Mies van der Rohe archive, Museum of Modern Art, N.Y.)

160. The pavilion as it was executed in 1929; an excellent example of the use of framing and transparency. Gelatine silver print. (Van der Rohe 1929)

The emergence of glazing technologies

Themes of reflection and transparency are frequently addressed in architecture, and especially in relation to the development of the technologies of glazing, a development which, it can be argued, continues with the use of mediated windows.

Transparent goblets of rock crystal were found in Egypt as early as the First Dynasty in the tomb of Hamaqa. Saqqara and the legend of a glass palace prevails in Jewish and Arabic cultures, for example, in the story of the Queen of Sheba in which Solomon's throne is placed on a reflective surface (Elkadi 2006). Little is known of the earliest glass manufacturing techniques, but well before 1450 BC, there were several factories in Tell al-Amarna that contributed to Egyptian industry during the Bronze Age (ibid.). Excavations in Tell al-Amarna reveal the existence of industrial structures, but there is little evidence as to whether the Egyptians made glass from raw material on site or whether glass was imported from the Middle East. Evidence of glass-working in the eleventh to ninth centuries BC is

documented in Frattesina, northern Italy, and on Rhodes, although archaeologists have not yet identified any remains of the glass furnaces which produced the high-quality glass produced at this time (Henderson & Ponting 1999; Henderson 2000). By the fourth century BC, glass was widely manufactured in many parts of the eastern Mediterranean and Iran.

At this time, glass was not yet used as a building material; the mild climate in these countries made it unnecessary to protect interiors, and the function of windows was rather to provide a ventilating opening (c.f. the etymology of the word 'window', denoting 'the wind's eye' in Scandinavian and Old Norse, *vindauga*). The invention of glassblowing in the first century BC has been considered the first step towards the use of glass in architecture (Wigginton 2002). Glassblowing skills were tacitly passed on within Syrian families, who had a base in Sidon, and managed to export their goods through the Roman Empire (Thorpe 1949). Fleming (1997) writes that Augustus imported Syrian and Judean craftsmen as slaves, in order to appropriate their skills in mould-casting and free-blowing. The first windows with glass panes applied to wooden or metal frames are found in structures built under the reign of Emperor Augustus, around AD 40. Migrating glassworkers from Venice and the eastern parts of the Mediterranean established the fine Roman glassworks in Eigelstein, near Cologne, in the first century AD. The German word *glesum*, meaning 'transparent', provides the origins of the word *glass* (Fleming 1997). The remains of circular furnaces and rectangular structures bear witness to the different parts of the production process: fritting, glass-melting and annealing.

There is evidence of glazed windows at the Atreum Vestae (the three-floor, 50-room sacred palace of the Vestal Virgins in Rome), and of windowpanes as large as 1 x 0,7 m in Pompeii's central baths. The glass was about 13 mm thick, and frosted on one side to prevent people from looking into the baths (Wigginton 2002; Glyn-Jones 1996; Clarke 1993).

Techniques to manufacture coloured glass spread in the second and third centuries AD, as seen in the architecture of the Byzantine period. Elkadi writes that the fall of the Roman Empire led to distinct changes in glass production in the north and south of Europe, and that the development of new techniques was confined to architectural purposes. The Christian Church prohibited the use of glass in AD 803. Glassmakers were then confined to monasteries, with France as their major centre (2006: 5).

In the fourth century, glass in architecture was abundantly applied to religious buildings in Rome, such as the coloured glass of Constantine's Church of St Paul (AD 337). Several scholars have pointed at the effect that the strong Mediterranean sunlight must have evoked as it projected through coloured windows onto dark interiors. Such light must have provided a pleasant contrast to the bleak urban settings (Fleming 1997).

The cylinder method for making flat glass panes for windows was used from the eighth century onwards, with the monasteries in Burgundy, Lorraine, and Rhineland as centres of export to other European countries. The techniques for making stained glass for churches and cathedrals was also well established across Europe by the twelfth century, as can be seen in the St Denis cathedral in Paris.

The rising dominance of the glassworks in Venice emerged in the fall of the eastern Mediterranean glass industry around the fifteenth century. This development coincided with the development of new technologies, such as *crystalo, filigree, millefiori,* and *calcedonio*, which yielded types of glass that did not find their way into the building industry.

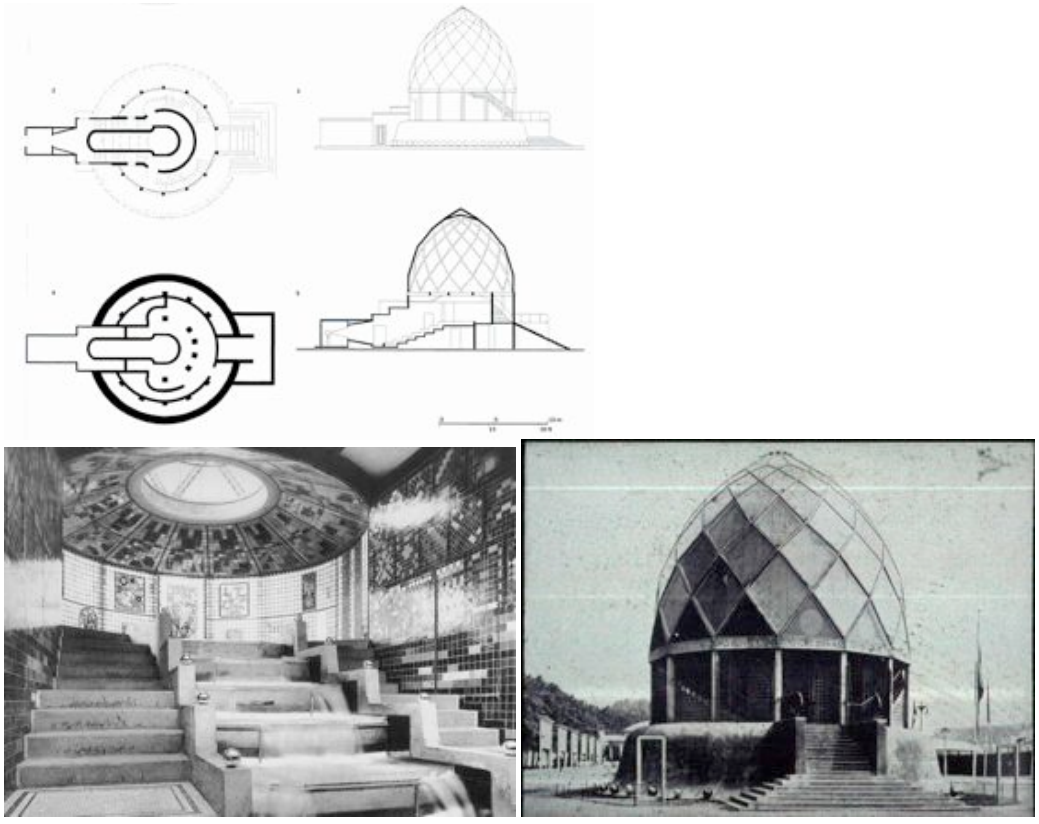
The invention of the cylinder method in the mid-nineteenth century made it possible to efficiently produce large sheets of glass. The new method (associated, in England, with the industrialist Lucas Chance) triggered a widespread interest in glass buildings, which coincided with a general fascination for the sciences, world travel, and exotic plants (Armstrong 2008). Museums were established across Europe as sites for greenhouses and great exhibitions, such as the Jardin des Plantes (Paris 1833), Palais des Machines (Paris 1889), the Crystal Palace (London 1852), and the Munich Glass Palace (1834). The shift towards glass buildings was accelerated by advancements in the iron industry. New architectural expressions sought new types of buildings that the modern and liberal society demanded. As documented, for example, by Walter Benjamin, the urban bourgeois society developed within well-lit, large,

monumental railway stations, exhibition halls, museums and shopping arcades; and it was the combination of glass and iron that the creation of such structures was made possible (Benjamin 1978; Buck-Morss 1989).

Bruno Taut's glass pavilion for the Deutsche Werkbund exhibition in Köln (1914) marks a significant turning point in terms of the modern movement that soon followed. Based on a concrete skeleton, Taut used coloured glass to create a prismatic dome that became a landmark at the exhibition and, in spite of being destroyed afterwards, is an exemplar of modern architecture and German expressionism (Colquhoun 2002; Pevsner 1960; Frampton 1980). Reyner Banham has shown that Taut's pavilion was closely linked to Paul Scheerbart, a man whose name has fallen into oblivion, but with whom Taut and other expressionists in the period between 1910 and 1925 were close (Banham 1959). In effect, Scheerbart was a literary forerunner and instigator of modern glass architecture. His 1914 book *Glasarchitektur*, dedicated to Taut, praised glass as the building material for a new era:

> Glass brings us the new age
> Brick culture does us only harm[178]

Scheerbart died in 1915, but Taut developed their shared vision of a glass culture in a series of fictive letters, known as the 'crystal chain', which he wrote under pseudonym (Frampton 1980).



161. Only black-and-white photos exist of Taut's seminal glass pavilion, which was built for the 1914 exhibition, funded by the association of the German glass industry. The fourteen-sided rhombic structure was made of thick glass bricks. The interior produced a kaleidoscope of colours, with glass-treaded metal staircases leading to the upper interior of the dome. Between the stairs is a seven-tiered cascading waterfall with underwater lighting, which in combination with the sunlight, filtered through the structure of concrete and glass, resulted in a cascade of light and colour. (Exterior photo and drawings from Weston 2004: 41; Interior photo: Taut 1914).

[178] Quoted by Banham (1959).

Between World War I and II, Europe was looking for new beginnings, and many experiments in the arts, crafts, and technology of the late nineteenth century were bearing fruit. In terms of glazing, Mies van der Rohe, Le Corbusier, and Frank Lloyd Wright, along with their many colleagues, were exploring the free passage between indoors and outdoors, confirming a unity between indoors and outdoors, which, according to Nordenfalk, had taken many centuries to evolve. In the following section, I will observe this historic development in the arts in more detail.

The mousetrap and other design strategies

A survey of the window in the visual arts provides important insights regarding the technologies or design strategies to achieve transparency, which I wish to address in light of more recent developments. Neither the Greeks nor the Romans managed what Robert Campain, the so-called Master of Flémalle, achieved in a series of paintings in the early fifteenth century: a realistically rendered room, depicting a window in which we get a realistic glimpse of an outdoor world. Nordenfalk points at how a finished mousetrap on the craftsman's windowsill, placed to attract passersby to the workshop, also serves the role of a 'springboard' for the spectator's passage from the interior into the exterior world.

162. Two examples which show the achievement of Robert Campain, the Master of Flémalle. Left: 'The Annunciation' (The Merode Altarpeice), 1425. Just outside his shop window, a mousetrap is on display to attract customers. Metropolitan Museum of Art, New York. Right: 'St. Barbara', 1438. Prado, Madrid.

As Nordenfalk suggests, we may look in vain among the wall paintings of Pompeii and Rome to find an indoor scene that can match those of the Flemish Masters of the early fifteenth century (Nordenfalk 1973: 233). This now seems so commonplace, but why did it take so long?

The simple explanation is that the two-dimensional representation of three-dimensional space is a more recent development. In fact, medieval representations of indoor scenes indicate very incomplete and vague spaces, where three-dimensionality is suggested only by elevated platforms in the foreground, on which immobile figures rest, such as seen in the following image, *Wedding of Mars and Venus*. A second layer of figures is seen behind the marriage bed, but the actual depth of the space remains elusive. If the back wall has an open door, it denotes an opening for guests, but does not provide a view.

163. 'Wedding of Mars and Venus' Fresco from the House of Marcus Lucretius Fronto, Late Third Style, ca. 30 AD Pompeii. See e.g. Clarke (1993: 156f) for an interpretation of the motif.

Archaeological excavations in Rome have shown that windows often framed a specific view from a living room towards the garden and that open peristyles were of general use in spatial design (Drerup 1959; Clarke 1993). Both Vitruvius and Plinius describe rooms in which murals provided the illusion of an extension to an outdoor scene or urban setting. The Pompeian House of the Vettii (Fourth Pompeian style) includes such a spatial extension. Nordenfalk stresses that although this is an interior, it is reluctantly depicted as one, modelled on the exteriors of classical theatre design.

> We are clearly invited to look out of the room into an open space. However […], we do not really do so from a simulated interior, but from the real one in which we are dwelling as spectators. Both the openings and the architecture behind them have the character of façade motifs, related to those we know from the Greek and Roman theaters, making the room itself look like an open courtyard. (1973: 235)

Towards the end of the classical period, three strategies to represent of an enclosed space developed. One was the *box-formula*, which appears in a manuscript at the end of the fourth century AD as part of an illustrated codex featuring major works by the Roman poet Vergilius (see figure below). The artist has depicted the scene where Dido is about to stab herself on her pyre, in a closed chamber, whose perspective is foreshortened. There is a door with a curtain, but it does not offer a view. Nordenfalk characterizes this as a typical antique treatment of space.

> [T]he artist's vision of indoor space fails him. Instead of being set into one of the walls, it cuts the foreshortened sidewall as a loose setting. It is left undecided whether it is a door seen from the outside – an opening into the room – or a door seen from inside and serving as an outlet. (1973: 236)

164. 'Dido on her Funeral Pyre'. Vergilius Vaticanus. (Vatican Library, Rome, Vat. Lat. 3225, Folio 40 recto)

The remaining two strategies provide exterior views of interior spaces: the *bird's-eye view* of an open space (for example, a city) and the depiction of a scene inside a *canopy*. In both of these, the indoor is as much an open as a closed space: a bird's-eye view of a city will lack a roof; a canopy will lack walls. For many centuries, these were the main strategies by which an interior could be visualized. The two are used side by side in a miniature of the first Bible of Charles the Bald, seen below. Nordenfalk draws our attention to the building on the left, a house with walls and a door left open, suggesting a passage between indoors and outdoors. But it is not the door that allows us to look into the space; it is the artificial opening of the front wall which discloses the interior. The canopy style is here combined with a house, yielding a *house-canopy* which, according to Nordenfalk, provided the medieval pattern from which a realistic interior ultimately emerged.

FIG. 7. Ananias dreaming and healing St. Paul. Detail from a miniature in the Vivian Bible, Paris, Bibliothèque Nationale, lat. 1, fol. 386v.

165. 'Healing of St. Paul'. Ninth century. (Detail from 'Vivian Bible', Bibliotheque Nationale, Paris, Lat.1. fol. 386v)

An intriguing miniature from 984 AD by the leading Ottonian painter, Master of the Registrum Gregorii, shows the *house-canopy* strategy reduced to a flat background coulisse, but where the artist nevertheless reintroduces "a notion of three-dimensional space, by winding a curtain around the shafts of two of the columns (…) Like the inquisitive scribe, peeping at him through the hole he has made with his stylus in the curtain." (Nordenfalk 1973: 239) In accordance with the medieval stratification of parallel layers, the Pope is located in the first, and the furniture and architectural details are in the second.

166. St Gregory in his studio, dictating to his curious scribes, from a 'Registrum Gregory' manuscript. (Trier Stadtbibliothek, cod. 802)

Remarkable as it is to achieve such an explicit depiction of an interior space that includes an exterior spectator, Nordenfalk points at the lack of congruence between interior space (contained between the columns) and exterior space (merely visible in the upper part of the miniature). A medieval artist was unable to simultaneously render an indoor and outdoor setting in correct proportion, and thus took refuge in a paradox: the interior depiction appears to be several times larger than the exterior. Other examples from the tenth century show an interest in visually rendering an interior, but there was a gap of a century and a half before the Italians embarked on the road which lead to the illusionistic interiors of the Master of Flémalle. It was only when the Italian masters of the Trecento conquered the

illusory technique of rendering three-dimensional spaces using the perspective that coherence in the treatment of the relationship between indoors and outdoors was found.

For example, Nordenfalk points at the *Birth of the Virgin,* in the Dome of Siena, a reencounter with Dido's box-like interior of a thousand years earlier, but where the figures are "no longer in front of the room, but inside it as its real inhabitants" (1973: 241). In addition to this important difference, the door through which the maids have entered is integrated as part of a wall (although too narrow). Through an opening in the back wall, we are invited to look onto a square. This feature is borrowed from classical wall-paintings which often provided the illusion of an extension to an exterior – but, stresses Nordenfalk, this is the first time an exterior is viewed through a simulated interior. A noteworthy contradiction is that while the bedroom has windows, we cannot see the outside sky.

167. 'The Birth of the Virgin', by Pietro Lorenzetti 1342. Museo dell'Opera del Duomo, Siena.

It was a famous illuminator in early-fifteenth-century Paris, Maitre Boucicaut, who provided the first outdoor view in a depiction of King Charles VI where the sky is noticeable from the royal bedroom, but without detail. This is where the achievement of the Flemish masters must be emphasized and why, in particular, the Master of Flémalle provides a poignant example. He invites us to watch Joseph as an ageing carpenter inside his workshop, from which a triple window offers a view onto the street, or a marketplace, of a Flemish town (see fig 6, above). As proposed by Nordenfalk, the mousetrap on the windowsill functions like a springboard for the spectator's passage from the interior onto the outdoor world, insisting on our inclusion in the painting. Still lacking skills in perspective drawing, the artist does not convince us that the workshop is located on the ground floor, nor is the relation between foreground and background accurately rendered. The work by other Flemish artists, such as Jan van Eyck, Roger van der Weyden, and Jan Vermeer van Delft bear witness to a similar struggle. They convincingly introduce a view through a window by which we, as spectators, are almost invited to communicate with the world outside.[179]

Interior painting remained an important genre throughout the eighteenth century. Whilst windows in architecture from this period tended to grow larger in size, paintings take less interest in the view to the outside.

Beginning with the French Revolution and throughout the nineteenth century, a shift in interest from interior to outdoor landscape painting is noticeable. The innovative work of Caspar David Friedrich fully concentrates on this theme. His seminal *Woman at the Window*

[179] Nordenfalk points at how Vermeer's famous painting *Young Woman with a Water Jug* provides an "intense feeling of a silent dialogue between interior and exterior" as the woman is about to open the window (1973: 247). The woman and the window are here placed very close to one another, in a way that would have been impossible in classical or medieval art, where an indoor setting was implied merely by the placement of figures on a floor seen in perspective.

(1822) can be compared to Wilhelm Tischbein's depiction of Goethe by a window in Rome, painted forty years earlier.

168. Left: 'Woman at the Window' by Caspar David Friedrich (1822), Nationalgalerie, Berlin. Right: 'Goethe am Fenster'. Wilhelm Tischbein (1787), Goethe Haus, Frankfurt.

In his endeavour to show how a spectator is involved in the communication between inside and outside, Nordenfalk uses these examples.[180] He compares the experience with that of being wrapped in darkness whilst immersed in a theatre play on a lit stage. In his reference to this as an 'invisible presence', where we, as spectators-in-action, now stand inside the space we share with the woman in the picture (who turns her back to us), Nordenfalk thankfully brings us back to the topic of this section. He concludes: "Whether we like it or not, we are as spectators taken into the picture, by being seated as passengers in the boat itself", this time referring to another painting by Friedrich, *A Journey in a Gondola on the Elbe.*

[180] He notes that the size of the window is much larger than ever before and the contrast between exterior daylight and dark indoor lighting is dramatized, "as if we were peeping through the keyhole of a dark chamber into the full light of another" (1973: 248). Whereas the old masters rendered an interior as a world, or a space separated from us by an invisible membrane through which we could not pass, in Friedrich's painting we are suddenly invited as spectators into the room. "Here for the first time we have the impression of having slipped into the room, sharing its view outdoors with the inhabitant." (ibid.)

DESIGNER OBSERVATIONS

In examining the designs for the *Mediated Museum* to a neighbouring park area, it may be asserted that spectators were immersed in a shared activity, and that the mediated window, or glass door, facilitated the experience of remote presence. The window here played the role proposed by Mies van der Rohe: it gave shape to a museum space, opened it, and linked it to the landscape. We may discuss how materials, textiles and furnishings were combined to allow the human eye to experience an audiovisual architectural extension. The interplay of reflection and transparency, as in the examples above, drew spectators into the picture.

Where the mediated window's similarity to a conventional window clearly ends, however, is where we attempt to address the functionality of an exterior enclosing membrane, one that provides climatic protection or ventilation. Arguably, a window or a door can be opened and closed, and represents a passage between indoors and outdoors. A closer look at the framing and transparency aspects of the *Mediated Museum* design example can illustrate a more detailed structure of gazing.

The *Mediated Museum* was an attempt to treat the exterior landscape as an extension of the museum space by means of opening the façade, via a mediated glass door. Features of the park, such as street signs, park furniture, and wall-sized backdrops of the landscape, furnished the museum interior, suggesting that the interior and the exterior were treated as one continuous space. The border between interior and exterior was diffused, at least from the point of view of museum visitors. There was, however, a noteworthy difference concerning the ongoing activities in each location. To museum visitors, the noise and visible movements of people digging outdoors triggered curiosity and directed their attention from the interior towards the exterior. There were sometimes large groups of people in both locations and we reflected that, in comparison, those inside the museum seemed to follow the museum convention of *looking at* (as opposed to *looking through*), rather than participating in, or interacting with people in the remote location (cf. Lanham 1993). They acted more as passive observers, at least in comparison to people who were engaged in digging with the archaeologists, who tended to use the different visual media used to make passersby aware of their activities and the 1897 Art and Industry Fair.

What further strengthened the direction of gaze towards the exterior was the difference in lighting conditions. The museum space was darker and the attraction towards the exterior daylight that filtered through the mediated window thus noticeable. From the point of view of the excavation site – a busy outdoor workplace, bustling with activity on a hot and bright summer day – one had to adjust ones eyes to (what seemed) a dark museum interior.

After a few days, our team deliberately reinforced the effect of the directed gaze, by placing a box with previous findings 'on the threshold' of the mediated glass door, precisely before one's feet inside the museum. This allowed a museum visitor to encounter the findings as if the objects were almost inside the museum space. In this sense, an architectural extension was achieved. Our design decision was based on the realization that the findings box was a useful conversation piece in the dialogue between visitors, staff, and researchers on either side of the window. Walking around the excavation site on the small island, visitors would almost always ask, 'What have you found so far?' Those who walked inside the museum exhibition were equally curious to see and hear what was going on outdoors. The objects in the findings box would trigger a conversation centred on the excavation and its context, and a dialogue would develop to which people on either side of the 'doorway' would contribute. In the mediated dialogic interaction that followed, we observed and sought confirmation that they were at ease, or behaved more or less naturally, as if they were standing in a real doorway.[181] Some, but on all, would comment on the mediated glass door

[181] The English poet and philosopher Samuel Taylor Coleridge coined the phrase, 'willing suspension of disbelief', which is commonly used in media technology discourse, in reference to how viewers may temporarily agree to suspend their judgment. Coleridge originally used the phrase in the context of writing and reading poetry in his *Biographia Literaria*, published in 1817.

and ask questions about its conception and technology.[182] Although we did not attempt to evaluate this specifically, our observations are that such questions came after the visitor had sought – and received – sufficient feedback (from the remote party) to confirm that the mediated interaction could be trusted. This is in line with previous research on the experience of mediated presence.[183] To be able to achieve mutual gaze is an important design feature in this process. As designers, our observations during the user study served confirmed that the mediated door facilitated mediated presence, but our minds were always on the possible improvements that could help to make people feel even more at ease in a mediated space.

Above, I have mentioned a range of concurrent features which contributed to the experience of a spatial extension: acoustics, lighting, visual cues (findings box), furniture (park bench) and other architectural elements (the mediated extension as an 'opening' in the wall, its wooden doorframe). Similar design features are at work in conventional architectural design, and this example shows that they should be also addressed in the design of a mediated space. In retrospect, our design assumption can be formulated as follows: If people were able to perceive and treat the window as a window (or the door as a door), by looking onto another location and interacting with another location, we could confirm that this mediated extension was interpreted as an architectural element, or part of the room. In the end, we concluded that the mediated glass door was treated as an architectural element, similar to other features of the interior architectural design.

My reason to explore Nordenfalk's essay at such length was, of course, that it allowed me to address the similarities between design strategies at hand, when contemporary artists, or architects, similarly invite us to share extended and mediated spaces. In regards to the design of the *Mediated Museum*, I suggest we can interpret this passage between indoors and outdoors in several related ways. My comments serve to show that the concepts of *framing* and *transparency* are applicable to presence design, but as is the case in architecture generally, it is the combination of many different design features that determines the overall effect of a design strategy. Nevertheless, it is useful to compare how the *framing* and *transparency* of the *Mediated Museum* example relates to those from the history of art and architecture.

First, in terms of the *Mediated Museum*, the inclusion of the spectator is carried out in ways not unlike what we encountered above in the seminal *Woman at the Window* or indeed in the work of the Master of Flémalle. We are drawn to the mediated window by its strong light and intriguing activity; it opens to an exterior setting, a crowded and populated excavation site. Often, someone is already standing or crouching by the glazed door, which means we see a person from behind, triggering our curiosity and inviting us to join in as spectator-in-action. The role of the findings box can also be compared to that of the mousetrap in Flémalle's painting: it acts like a 'springboard' for our passage from the interior into the outdoor world. However, the transparency achieved by Bonnard is not possible here. A museum visitor can look through the glazing provided in the museum extension, but cannot

[182] We would answer such questions briefly but tried to avoid a conversation about the technology. If needed, we would take a person to the side and give a full account of the combination of spatial and technical design that enabled mutual gaze. The experience of mediated presence is individual and related to prior knowledge and experience of the user. Therefore, it was important to confirm that when a mediated dialogic interaction took place, those involved behaved naturally towards each other. In previous prototyping we learned that if technical equipment was visible or required monitoring, some users felt insecure. This was one reason the cameras and other equipment were embedded in our designs.

[183] Possibly due to the widespread use of displays in museum contexts, visitors often adopt a role as passive observers. The effect is that a person does not always consider that what they see (e.g. a mediated glass door) might be a projection in real time. We have often noticed that it takes a moment before this realization occurs. This is part of a confirmation process in which feedback from the remote party is crucial. Such feedback is also related to the establishment of trust, as a prerequisite for the experience of (witnessed) mediated presence (Nevejan 2007; IJsselsteijn 2004). Our decision to design a door stemmed from our interest in encouraging users to 'trust' the environment. A door is perceived differently than a TV display. In this case, the door effectively concealed the displays, which were placed vertically, so as to avoid an association to the familiar 16: 9 format of film and television media. There are, of course, many other ways to integrate spatial and technical design.

reach out from the mediated window, or glass door, as the lady does in *Dining Room in the Country*.

Second, I would like to remark on the integration of the mediated glass door in the overall spatial design of the Museum of National Antiquities. While I will not directly imply that the medieval *house-canopy* perspective applies to the *Mediated Museum*, its black textile framing was a foreign element in the spatial design of the museum as a whole.[184] This is an austere and sober building, where openings are sharp and distinctly cut through heavy and load-bearing plastered brick walls. Although the velvet textile served to improve the lighting conditions and acoustic space in the proximity of the window, it almost created an enclosure which infringed on the larger space, rather than a spatial extension. An alternative approach could have perhaps been to allow the window space to reach beyond the facade, similar to the way a bay window functions. In considering our addition of the mediated window to this interior, which already had several marked openings, it might have been better to choose another wall than this façade.

My final reflection concerns the way in which the design strives to establish a unity between indoors and outdoors. I suggest this worked better in one direction than in the other. From the museum interior, as from Bonnard's dining room interior, the exterior landscape is clearly brought into the interior: the passage is free, and if we cannot feel how 'the sweet Mediterranean breeze fills the entire space', to use Nordenfalk's words, it is because we instead sense the birds and salt of the Baltic Sea. The *Mediated Museum* window thus serves as a passage from the exterior to the interior. This can partly be linked to the impermanent qualities of the temporary architectural context at hand on the excavation site, where a tent-like construction was not a sufficient setting for a window or a glass door. Whether mediated or not, such architectural elements denote openings and must be integrated into more substantial constructions. Yet there is certainly potential for the mediated window to constitute an exterior extension. As an architectural element, therefore, it remains to be seen how architects will find use its capacity to establish synchronous, immaterial façades and spatial extensions.

The aim here has not been to provide a comprehensive account of how this may be achieved in architecture, but to address the potential contribution of architects to a currently diversified research field. With the claim that architecture and artistic practices are insufficiently represented in presence research, I have proposed the use of aesthetic concepts that are immanent to architecture and related visual and digital practices. In the following chapter, we shall look at a few other design strategies available to presence designers.

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[184] There is possibly a comparison to be made with the miniature by the Master of the Registrum Gregorii, whose curious scribe is present, yet in a separate space – a strategy of transparency created by means of textiles, which have been draped around the classical interior. One of the textiles appears velvet-like, and has been drawn, thus revealing a small spatial extension.

design example:
atwood in Norway

169. Ekern seamlessly hands over the book to Atwood.

While the window and the glass door were two illustrative metaphors to use in reference to mediated spaces, especially in terms *framing* and *transparency*, many other design metaphors exist in presence design. In this chapter, I take a different approach in order to explore the concept of shared mediated space in presence design.

The design example *Atwood in Norway* was streamed live on the Internet, thus illustrating the use of mediated spaces in live television broadcasting.[185] The example is useful since it exposes a range of design strategies available to presence designers today.

[185] The example was introduced in Chapter 1. The designers behind the event represent the Shared Virtuality research group of Lillehammer University College, led by Professor Claus Aase Schibsted Knudsen as part of the project Television in a Digital Environment (TIDE; Knudsen & Puijk 2009). The project has implemented the teleprompter-based design concept to achieve mutual gaze, developed by myself and Mats Erixon 1999-2003, as part of interdisciplinary research to which also Knudsen contributed as part of doctoral studies at the Royal Institute of Technology in Stockholm (e.g. iSpaces project referred in Chapter 1 (cf. Knudsen 2004).

While a TV audience is accustomed to live broadcasts to which a participant contributes from a remote location, it is unique that a journalist and his remote interviewee seem to share the same stage and convincingly look one another in the eye.[186] That participants can achieve mutual gaze is widely accepted as a key element in presence design, based on the knowledge that subtleties of nonverbal communication are easily lost (Heath & Luff 1991; Rutter et al. 1984).[187]

170. Those following the live web streaming were invited to follow the close-up shots, such as these shown above. Those present at the outdoor venue in Lillehammer could follow the web streaming on an additional display (seen to the left of the stage on the images that follow).

At one point the host, Ekern, hands over Atwood's book in order for her to initiate the reading, as seen above. Although some may have interpreted this as pure magic, the explanation had already been laid out before the audience, as I will describe in detail below.

The spatial design that enabled Atwood and Ekern to achieve eye contact, created an absorbing atmosphere, whereby the audience was drawn into the intimate exchange onstage. It is only when the dialogue ends, and Ekern leaves the table, that we experience an odd situation. Margaret Atwood is suddenly left alone, and by herself at the table, while we become aware that she is not actually here with us. As spectators, we are at once thrown back into a more conventional role of the passive audience; while in the moment previous, we were actively engaged in a dialogue on a live stage. The excerpt from the broadcast, seen below illustrates this situation.

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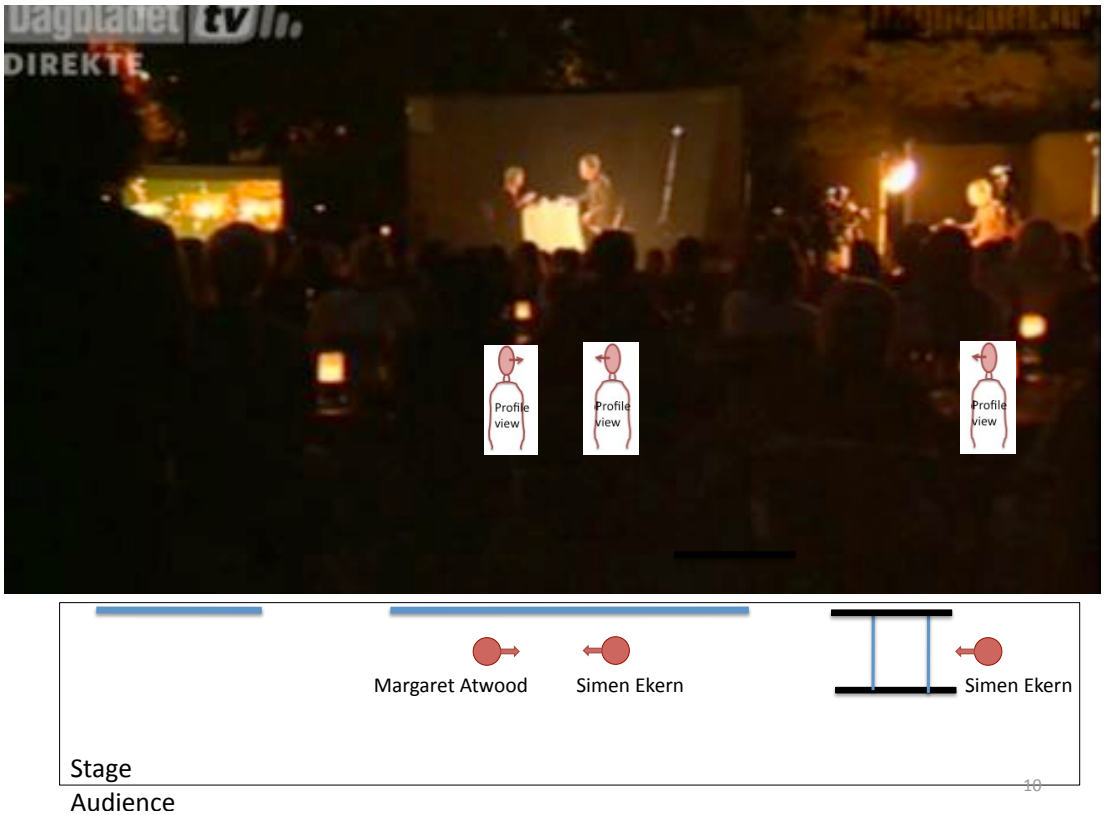
[186] To provide an illusion of gazing straight at an anchor or TV audience, a remote participant in a conventional live set-up will need to look into a camera lens. Whereas it would be more natural (thus preferred) to look straight at the TV anchor one addresses, the display of the latter and the camera are usually not aligned (usually because a large camera would block such a display). As an alternative, a teleprompter-like design, which involves reflective mirrors, may be used. This enables an interviewee to look straight at the journalist s/he is addressing whilst still being captured by a camera lens.

[187] As noted in Chapter 5, cognitive scientists discuss eye gaze as a control mechanism for social behaviour, for example, to signal intimacy. Hence mutual gaze is important to the establishment of trust, not the least in mediated interaction (Heath & Luff 1992; Heath et al. 1995; Rocco 1998; Acker & Levitt 1987' Ishii & Kobayashi 1992; Fullwood 2006).

171. Ekern leaves the stage and Atwood is left alone.

Let us observe the venue in some detail. A large display facing the audience features Atwood and Ekern opposite one another, sharing a table. On the right hand side of the stage, however, we find Ekern sitting by himself, in profile. One section of his table is visible. Ekern is actually facing a teleprompter-based design piece, which allows him to look Margaret Atwood straight in the eyes. The web-streaming footage only occasionally allows us to see exactly what he sees, and has prioritized the edited view of the two in profile. Ekern is present in person, and in conjunction with effective light design and acoustic synchronization of the two spaces (Atwood, in fact, remains indoors, which is hardly noticeable), this design contributes to our experience, as spectators, of observing a shared a venue. A schematic illustration of the spatial analysis is provided below. This design which clearly extended Atwood's remote location to the Lillehammer space can also be described as an example of spatial montage: the two spaces are juxtaposed to effectively create a mediated space.

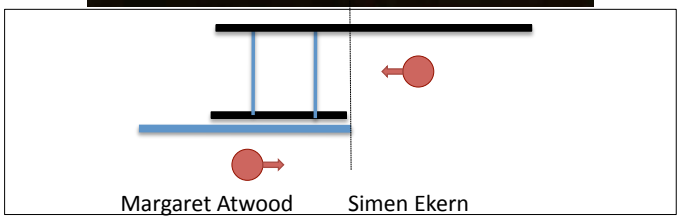
172. *The concept of spatial montage: a smaller space (Toronto) is added to a larger space (Lillehammer). Together the two establish a mediated space. The fact that Atwood is seated indoors in a studio in Toronto, yet appears on a live outdoor stage is well concealed.*



173. *Schematic analysis of the spatial layout as perceived by the audience. The red arrow on the plan denotes the direction of gaze of the persons seen on stage. As noted, Simen Ekern appears twice. To the right, Ekern is seen in profile, facing Atwood who appears in the teleprompter-based design prototype before him. The teleprompter design in my plan is represented as a volume in black.*

Ekern effectively appears twice onstage, a fact that may be discussed in terms of a spatial confusion. We see him to the right, seated at a table by the teleprompter design; and also centre stage, sharing a table with Atwood. In design, there are always many different ways to achieve a similar set-up. One possibility here could be to move Ekern and the teleprompter design to centre stage, and place Atwood's display in such a way that it shields Ekern's table. As illustrated below, such an alternative would allow Ekern to appear only once, and in person, on stage. As in the original set-up, it would also both parties to turn to address the audience on occasion.

Alternative approach



Stage
Audience

174. An alternative spatial design strategy, in which Ekern would appear merely once before the audience.

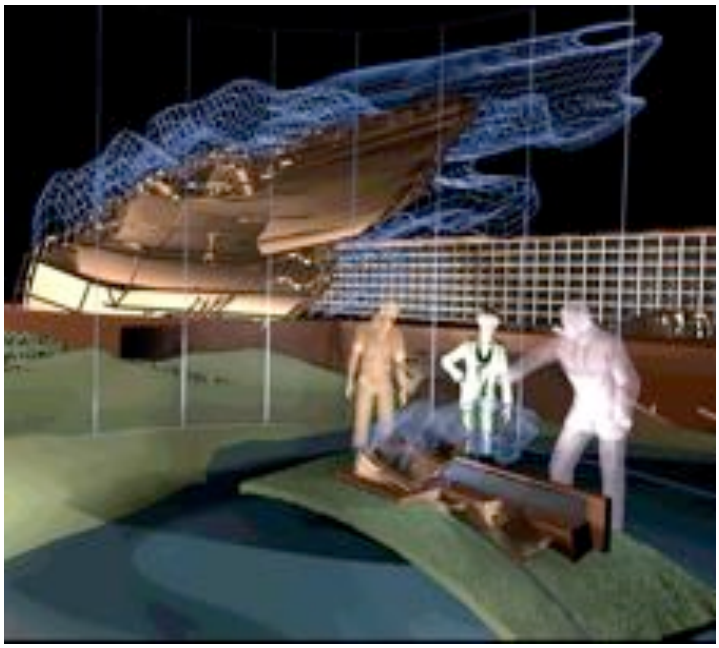
chapter 7 spatial montage and spectatorship

7

Peter Anders' 'cybrids'

In presence design, as in spatial design, certain spatial views are favoured over others. It is therefore important to observe how the relationship between different spatial layers is constructed. While in one context, such as in the *Atwood in Norway* example, one location may be defined as primary, though this is not always the case. Collaboration in a work environment, for example, may depend on establishing equal opportunities of presence in a mediated space. My examples of the *Three Halves*, the furniture series for the *Mediated Unemployment Services* and the *Mediated Therapist* illustrate different approaches to this design problem. Another relocation strategy is to place every participant in a neutral, or 'cybrid' setting, such as envisaged by the architect Peter Anders, below (1999). In this image, an architect is engaged in a discussion regarding a model with the consulting engineers; their meeting is, in fact, held inside a mediated space, which contains virtual representations of the envisaged design.

We can similarly imagine Ekern and Atwood, from the *Atwood in Norway* example, placed in a completely different and neutral setting. This could be achieved simply by changing the backdrop in both locations, which would result in a third shared space: a 'tertium quid', to use Eisenstein's concept.



175.Peter Anders' concept of 'cybrids', a superposition of parallel physical and digital representations of space. (Anders 1999)

INTRODUCTION

I have already pointed out that mutual gaze is an important feature to consider in designing mediated spaces. Of equal importance is to establish similar acoustic and lighting conditions across the different locations, and to synchronize the spaces in such a way that people are represented in their natural size, thus ensuring a spatial correspondence between one space and another. As seen in the examples, many design strategies facilitate this kind of spatial montage.

A design strategy commonly used in television to merge images and change backdrops is to use a *chroma key*, a technique also referred to as *colour keying*.[188] Schibsted Knudsen has described the use of *keying* in mediated spaces and demonstrated its potential for spatial montage during a conference presentation in Banff, Canada, where the conference venue was temporarily extended to Stockholm (Knudsen 2002). As Knudsen switched to the next slide, two Swedish research colleagues appeared, seemingly live on stage and present in Banff, yet as part of the presentation, into which the live video footage was streamed. Since their backdrop was identical to the view outside the Banff conference venue, their mediated presence at the conference was convincing.

176. Schibsted Knudsen extended the Banff venue by inviting two Stockholm colleagues (left: Leif Handberg, right: Ambjörn Naeve) to share the stage, as part of a PowerPoint presentation. In Stockholm, a video camera captured the two researchers who were seated in front of a blue chroma key textile, allowing Knudsen to manipulate the backdrop.

I used *Atwood in Norway* as an example of another designer's well-executed presence design and carried out a limited spatial analysis in order to introduce the current chapter. The concepts of *spatial montage* and *active spectatorship* that I discuss here are founded on design experiences and reflections some of which are placed in Appendix 1, 'Further design examples'. There I discuss prototypes for *A Mediated Control Room*; *A Mediated Pub*; *Mediated Mingling Between Two Conferences*, and discuss five examples carried out by other designers: *A Mediated Music Masterclass*; *Point 25 Mediated Performance Venue*; and *Two Mediated Dissertation Defences;* that I attended and subsequently analyzed.

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[188] Typically used in weather forecasting broadcasts, *colour keying* (using bluescreen or greenscreen backdrops) allows one image to be replaced by another. As a meteorologist stands before a bluescreen backdrop, different maps can be displayed on the blue surface. In consequence, images can be displayed onto any surfaces clad in blue, thus allowing a range of creative possibilities. The process is based on the luminosity of colours and a so-called *luminance key*. In a luminance key, everything in the image – beyond or below a set brightness level – is 'keyed out' and replaced by either another image, or a colour from a colour generator or projector.

ONSCREEN AND OFFSCREEN SPACE

The risk of becoming disoriented in a mediated space increases with the number of times a person is depicted. Although we may be able, as Gombrich suggests, to intellectually assign a lesser value to additional displays, these nevertheless present a contradiction (Gombrich 1960: 202). In the *Mediated Music Masterclass* example, we want to assign the remote teacher, as displayed, a local presence inside the room (see Appendix 1, 'Further design examples'). The display of the singer, in consequence, ought to be discarded, since the singer is already present in the room. This situation could possibly be balanced by introducing larger displays of the remote location, preferably as an extension of the interior walls, thus allowing parties on both sides to share a larger mediated space with one another.

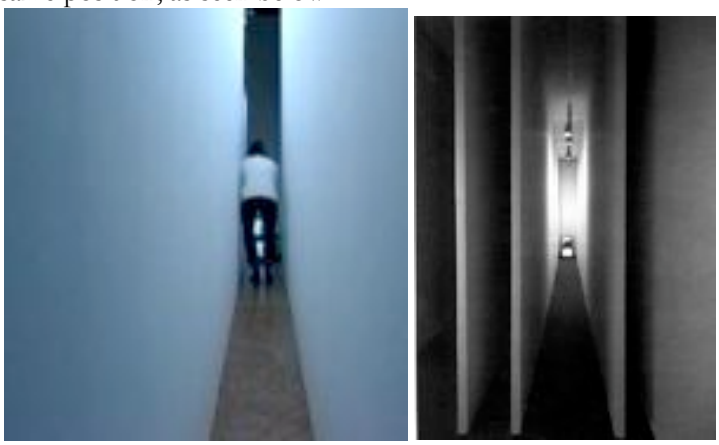
In the case of a mediated glass door, which extended a museum to an archaeological excavation site, users stated that their view of the remote location was too narrowly restricted. Presented with the excitement of digging, they were discontented to not be able to follow the activities as new sites of excavation opened up. They wanted to see more than the opening of door provided. In effect, a remote party in mediated interaction will notice that the volume of shared mediated space, by necessity, is smaller than that of one's local space. Activities may spread outside the visual field of a remote spectator, an area we may categorise as *offscreen* space.

177. There were limitations to what users perceived of the remote archaeological excavation in the case of the 'Mediated Museum'.

The relationship between offscreen space and shared mediated space was schematically illustrated before. While architects, artists and film-makers have made use of offscreen space as part of an aesthetic, it remains to be seen how it may contribute to an audiovisually extended architecture, without resulting in a sense of frustration. At the same time, it was to such emotions that, for example, Andy Warhol appealed made several of his films. His experiments included multiple cameras and pre-recorded footage, which would quadruple the images of an actor, who on occasion would address someone just offscreen, off-frame. As Anne Friedberg has noted, "Warhol kept his performers in the claustrophobic frame of the shot, often addressing someone, perhaps the camera operator, just off-frame." (Friedberg 2006: 208) Friedberg uses the French expression *mise en abyme* – a commonly used concept in the visual arts which means 'placing into the abyss' – to characterize this visual experience, which comes close to that of standing between two mirrors that produce the infinite reproduction of one's own image. In his film *Outer and Inner Space* (1965), Warhol allows the actress Edie Sedgwick to address a depiction of herself, as if in a mirror, but with a time delay.

178.Image from 'Outer and Inner Space' directed by Andy Warhol in 1965.

Similarly, in *Live-taped Video Corridor* (1969-70) Bruce Nauman placed two monitors at the end of a corridor on top of one another. Whereas one monitor displayed a live image captured from the entrance to the corridor, the other showed a pre-recorded video from the same position, as seen below.



179.Image from Bruce Nauman's film 'Live-taped Video Corridor'. (Nauman 1969)

In film (as in shared mediated space), an image is limited in size by its border, and we seem only to perceive a portion of space. It is this portion of space contained inside an image that Aumont et al. (1992) refer to as the cinematic frame or *onscreen space*. Critical and theoretical accounts of cinematic space have more often privileged these visible spaces on the screen over the invisible spaces beyond. A handful of film theorists (for example, André Bazin, Noël Burch, Pascal Bonitzer and Gilles Deleuze) analyze the dimensions, properties and potentialities of hidden spaces. Aumont et al. define offscreen space "as the collection of elements (characters, settings, etc.) that, while not being included in the image itself, are nonetheless connected to that visible space in imaginary fashion for the spectator" (1992: 13f). Offscreen space, therefore, is fundamentally bound to onscreen space and only exists in relation to the latter. Although there is a distinct difference between the two (onscreen is visible, offscreen is not), they belong to the same homogenous space that Aumont et al. call film space or scenographic space. Other critics, such as Burch (1973), reserve 'imaginary' for the offscreen space which has not yet been presented; and 'concrete' to designate space that is now offscreen but has already been presented.

Very early on, directors of cinema learned to manipulate the communication between onscreen and offscreen space in order to "construct the offscreen from within the onscreen" (Aumont et al. 1992: 14). However, early spectators of cinema thought differently about offscreen space than we do. Today, we make spatial inferences between different shots, but early cinema and its audience could not conceive of relations between shots in spatial terms. Persson (2003: 42f) illustrates this with a sequence from the film *Dr Jekyll and Mr Hyde*, made in 1912.

180. Film excerpt from the end of the film 'Dr Jekyll and Mr Hyde' from 1912, directed by Lucius Henderson. The close-up insert of a bottle of poison precedes a longer shot in which Mr Hyde drinks the poison and falls down on the floor, seconds before the police enters the room. (Henderson 1912)

The scene in which Mr Hyde destroys his lab is followed by a close-up of a bottle of poison against a black backdrop. Next, the viewer is taken back to the long shot in which Hyde drinks the poison, and is found dead by his fiancée and the police. Persson points at the contrast between the still hand in the inserted sequence and the long shot. These two segments appear to inhabit different spaces. A modern audience would likely interpret the insert of the hand as the camera/spectator moving closer to the object or face (reflected in the term 'close-up'). The early spectator, however, would have likely conceptualised it in terms of the object magically popping out towards the spectator, interpreting it as being outside of any spatial realm. At the time, the camera was still perceived as a "stand-in for the immobile spectator in the theatre seat" (Persson 2003: 43f).

View boundaries

Depending on a spectator's prior knowledge and experience of artefacts, bodies, interiors, exteriors, s/he may assume that both objects and space continue outside the frame, although this is not explicitly visible (Persson 2003: 29f). Aumont et al. point at three principal kinds of spatial relations in film: (1) A movement in and out of onscreen space, most often at the lateral sides of the image, but also at the top and bottom borders; (2) Various direct interpellations of the offscreen by an onscreen element, typically a character. The most typical means used is the 'glance offscreen', but we could also include here the methods that an onscreen character may use to address an offscreen character, particularly speech and gesture; (3) The offscreen may be exhibited by characters or other onscreen elements that are partially offscreen. A typical instance would be a tight close-up of a character, which almost automatically implies the presence of an offscreen space containing the person's unseen or 'cut off' portion (1992: 14).

Boundary extension is a term from perception theory that is referenced in a large number of studies where subjects have been asked to recall an image by making a drawing of it. When they do they tend to remember a much 'larger' portion of the space that was contained within the frame. Such studies suggest that offscreen space is actively constructed and constitutes a vital part of the cognitive experience of imagery (Hochberg et al. 2007; Gottesman & Intraub 1999).

Aumont et al. propose the term 'out of frame' (*hors cadre* in French) to describe where technical equipment and filmmaking activity occurs. "This term may be inconvenient since it is rarely used, yet by way of compensation it offers the advantage of referring directly to the frame, that is, to an artefact of the film's production, and not to the screen space, which is already produced and taken in by the illusion." (1992: 18) To illustrate this, they refer to Eisenstein, who advocated a cinema where the boundary of an image would serve as a sort of 'caesura' or 'division' between two radically different worlds. While Eisenstein does not actually employ the phrase 'out of frame' in the sense that Aumont et al. propose, his developments of the idea certainly underscore their terminology.

Film space as window onto the world

As pointed out by Aumont et al., the experience of watching a film is usually strong enough to make a spectator forget not only the flatness of the image, but sometimes the absence of

colour (if the film is black and white) or the absence of sound (in silent film) (Aumont et al. 1992: 13). We may perhaps not forget the edges of the image, which are always more or less consciously present in our perception, but we will often be made to forget the fact that beyond those edges there is no image. Moreover, the onscreen space is usually perceived as part of a larger scenographic space. Even though the onscreen space is the only visible part, this larger scenographic space is nonetheless considered to exist around it.[189]

André Bazin (1992) referred to the screen image as a 'mask' or a 'window onto the world', borrowing the phrase from Alberti (see Chapter 3). Bazin's point is that if the image works like a window to make a fragment of the (imaginary) world visible, then there is no reason to suspect that this world would stop at the image's edges. Critics have since challenged the idea of film space as a 'window onto the world', because such notions conveyed idealistic prejudices that encouraged one to accept a film's fictive universe as reality. The genre of representational films constitutes the vast majority of the world's production (including documentary production), even though, early on, this same type of cinema was sharply criticized (Aumont et al. 1992: 15).

As in film space, mediated space is defined by more than just visual traits. First, sound plays a great role, partly because the ear cannot distinguish between a sound made onscreen or offscreen (Aumont et al. 1992: 15). The homogeneity of sound is one of the major factors involved in the unification of film space as a whole. Second, the temporal unfolding of the story, or narrative, necessitates taking into account the continual shift from onscreen to off-screen, thereby assuring their immediate communicativeness. Such aesthetic concepts and strategies, employed in one visual practice precisely to establish presence, can therefore be very useful in the design of mediated spaces. As spatial design establishes acoustic space, audiovisual extensions and video-mediated spaces should therefore be included in architectural design.

Architecture, generally, is characterized by the interplay of materiality and immateriality. In some cases this will bewilder and confuse, while in others, a spectator is unnoticeably guided towards a selected destination. Whereas confusion on the part of the beholder is sometimes immanent to a work of art or architecture, and frequently used as a narrative technique, architectural style may also be related to the functionality of a building. Foucault has dismantled how the mechanisms of institutional power are reflected in architecture (as have Markus and others who followed), by means of analyzing the materials and spatial organisation of buildings (Foucault 1977; Markus 1993). The integration of mediated spaces into architecture is a fairly recent practice, and there are not enough examples to allow us to make general reflections on its emerging aesthetics. It is, however, as important to consider the implicit power mechanisms built into in presence design, as in architecture generally. The juxtaposition of real and virtual space that characterizes these architectural extensions must be subject to further spatial analysis. Perhaps, in line with what Lev Manovich has proposed, a new architecture emerges.

> Borders between different worlds do not have to be erased; different spaces do not have to be matched in perspective, scale, and lighting; individual layers can retain their separate identities rather than being merged into a single space; different worlds can clash semantically rather than form a single universe. (2005: 158)

While a majority of the design examples that I refer as part of this thesis establish a mediated spatial extension by providing a single view of the remote location, others make use of several cameras. In the schematic spatial analyses I provide in 'Appendix 1, Further Design Examples', I discuss the spatial confusion that often results when 'borders between

[189] Knudsen uses six terms to denote different types of offscreen spaces, from the user's point of view in reference to video- mediated spaces: over, under, camera left, camera right, a hidden place within the frame, and the space behind the camera (2004: 39).

different worlds' are left unaddressed. I quite agree with Manovich that all borders do not have to be erased, but I find that there is a need to consider their design. The use of multiple bird's-eye view cameras to monitor spatial activities has a long tradition, and can cause both confusion and a sense of being supervised. Such feelings were expressed by workers in the office which was audiovisually extended from Palo Alto, California to Portland, Oregon in 1985, and which constitutes the original *Media Space* exemplar, seen below (Bly et al. 1993, see discussion in Chapter 3).

181. The multicameras in the original 'Media Space' were not all used for real-time transmission but were intended to let the users record a mediated interaction and return to it at a later stage, by watching the videotapes. (Photo from Harrison 2009)

As seen above, the office workers were able to select between different views of the remote location, from small monitors by their desk. While this early project has contributed many important insights regarding mediated interaction, the monitors and cameras used were never integrated to the architecture of the work environment, leaving the workers aware of an experimental and temporary set-up, which was one of many parallel on-going research activities at the office.

What will follow from the continued integration of architecture and media technology practices remains to be seen. We can, nevertheless, turn to recent attempts to discuss the potential integration of practices. What are, for example, the possibilities in mediated interaction to provide additional views of a remote location, without producing multiple copies of the persons present? Is it possible to find aesthetically appealing ways to allow users to share mediated, offscreen space. The examples in Appendix 1 illustrate some of these possibilities and I discuss different design strategies that enable mediated extensions and spatial relocation. Some of my own design examples employ the architectural grammar of doors, windows and large openings in walls, while others used furniture to provide a transition from one real space to another. These are quite familiar strategies to link architectural spaces. Some of these attempt to explore the possibilities of mediated three-dimensional space – the combination of real and virtual space – to a higher extent than others. The practice of presence design is still in its early phases of development, and we can expect more from its practitioners in years to come. Perhaps it is only a matter of time before architecture enters the age of 'liquidity and flux' that effectively makes use of hybrid spatiality. Such a vision was articulated by Asymptote Architects, when they were commissioned by the Guggenheim Museum to design an extension in cyberspace:

> When speaking of an architecture for the next millennium there are two conditions to consider: the physical space of architecture as we have always known it where enclosure, form and permanence will undoubtedly persevere, and the realm of virtual architecture, now emerging from the digital domain of the Internet. Objects, spaces, buildings, and institutions can now be constructed, navigated, comprehended, experienced, and manipulated across a global network. This is a new architecture of liquidity, flux, and mutability predicated on technological advances and fuelled by a basic human desire to probe the unknown. (Drutt et al. 2001)

The design strategies I have discussed throughout this and previous chapters can be referred to as different forms of spatial montage. The technique of juxtaposing images by editing – montage – originates in film. In the following section I will investigate this concept in greater detail.

SPATIAL MONTAGE AND 'TERTIUM QUID'

In the 1920s, Russian film directors and theorists Sergei Eisenstein and Dziga Vertov explored the technical and aesthetic potentials of montage. For Eisenstein, film montage enabled him to communicate more than he could convey with individual images. Two or more images edited together could create a 'tertium quid', a third element which constituted a whole greater than the sum of its individual parts (Eisenstein 1992). A good example, in the context of presence design, is the 'Odessa Steps' sequence in Eisenstein's 1925 *Battleship Potemkin*. By stretching the time it took for the crowd to rush down the stairs to seven minutes (much longer than it would have taken in real time) he manipulated the audience's experience of time.

182. Snapshots from the famous 'Odessa Steps' film sequence in 'Battleship Potemkin'. The mother (left) anticipates the pram rolling down the stairs. It starts rolling whilst a large crowd is seen descending. (Eisenstein 1925)

In his book *The Language of New Media* (2005), Lev Manovich has demonstrated that the aesthetics of Eisenstein and Vertov have informed subsequent film practices. Manovich has proposed that the concept of 'montage' is applicable to many 'new media' artefacts. This thesis may be seen as an attempt to test if this is the indeed the case. Is spatial montage a useful concept in designing the combination of material and immaterial artefacts which constitute mediated spaces as an audiovisually extended architecture? Manovich does not consider architecture as a new media object, but he does acknowledge montage as a spatial concept.

> Thus to qualify as an example of montage, a new media object should fulfil two conditions: Juxtapositions of elements should follow a particular system, and these juxtapositions should play a key role in how the work establishes its meaning, and its emotional and aesthetic effects. […] Borders between different worlds do not have to be erased; different spaces do not have to be matched in perspective, scale, and lighting; individual layers can retain their separate identities rather than being merged into a single space; different worlds can clash semantically rather than form a single universe. (Manovich 2005: 158)[190]

To further explore the concept of montage in relation to architecture, I turn to Sergei Eisenstein who was, indeed, trained as an architect.[191] For Eisenstein, montage was a spatial term, a concept he developed in an article in the late thirties, 'Montage and Architecture'.[192] Eisenstein regarded architecture as a predecessor to film and his expectations for the new media were declared with explicit reference to architecture:

> "Painting has remained incapable of fixing the total representation of a phenomenon in its full visual multidimensionality. (There have been numberless attempts to do this). Only the film camera has solved the problem of doing this on a flat surface, but its undoubted

[190] Cf. Bolter & Grusin's (2000) concept of *hypermediacy* which enables a reader to recognize different media layers from a process of *remediation*, also used by N. Katherine Hayles (2002) with reference to how a reader is invited to recognize the structures from which materiality is rendered visible.

[191] Eisenstein was born in Riga in 1898 and his family moved to St Petersburg in 1910, where he studied architecture and engineering at the Institute for Civil Engineering between 1915-1918. His fascination and aptitude for the arts, especially line drawing, is well documented (see e.g. Bordwell 1993; Seton 1952; LaValley & Scherr 2001; Fabe 2004; Goodwin 1993).

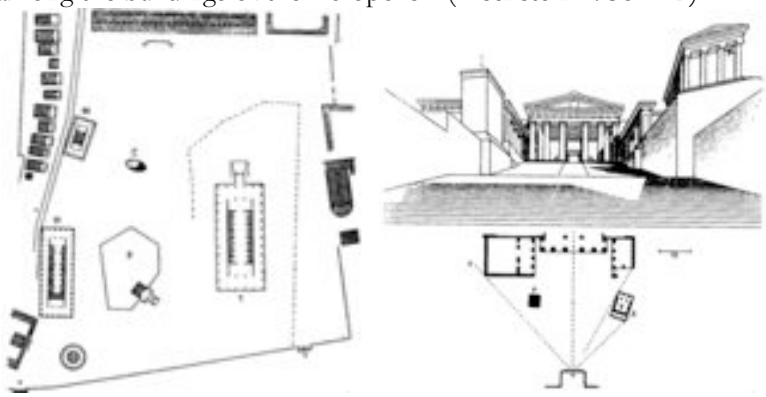
[192] According to Anthony Vidler, the article is part of Eisenstein's uncompleted work on montage. Drawing on his previous experience as a practicing architect and set designer, Eisenstein compared architectural composition to cinematic montage in an earlier essay on Piranesi's engravings (Vidler 2000: 118).

> ancestor in this capability is — architecture. The Greeks have left us the most perfect examples of shot design, change of shot, and shot length." (Eisenstein ca. 1938: 112)

One of several scholars who describe the alliance of architecture and cinema in Eisenstein's aesthetic, Anthony Vidler stresses that it is its capacity to embody the principles of montage, that allows Eisenstein to regard architecture "as a spatial art experienced in time" (Vidler 2000: 119). Vidler shows how Eisenstein contrasted "two 'paths' of the spatial eye: (1) the *cinematic*, where a spectator follows an imaginary line among a series of objects, through the sight as well as in the mind – 'diverse positions passing in front of a mobile spectator' – and (2) the *architectural*, where 'the spectator moved through a series of carefully disposed phenomena which he observed in order with his visual sense'. In this transition from real to imaginary movement, architecture is film's predecessor." (Vidler 2000: 119) [my italics and numbering]

Eisenstein's aesthetic is founded on the relationship between architecture and the new possibilities that a new media provided. I seek to extend the boundaries of architectural design by arguing that it may incorporate presence design. It is therefore fruitful to observe Eisenstein's concept of spatial montage in some detail. Eisenstein's perspective on film was essentially architectural, as I shall explain.

For Eisenstein the *architectural path* coincides with the concept of a 'promenade architecturale' elaborated by Le Corbusier around the same time.[193] To make his point, Eisenstein refers to a study of the Acropolis, conducted by the architectural historian Auguste Choisy (1889), which demonstrates the 'successive tableaux' and 'picturesque' composition of the site. Eisenstein introduces the study, which he quotes extensively in the article, as follows: "I shall not alter a single comma and I would only ask you to look at it with the eye of a filmmaker: it is hard to imagine a montage sequence for an architectural ensemble more subtly composed, shot by shot, than the one that our legs create by walking among the buildings of the Acropolis." (Eisenstein 1938: 112)



183. Eisenstein's diagrams of the successive positions of the Acropolis as described by Choisy (ca. 1938). The 'sequence' that 'our legs create' marked by a dotted line (left) and 'a view of the Propylaeum (right). Cf. Auguste Choisy's analysis, 'The Acropolis, First Sight of the Platform'. (1889: 415)

As noted by Giuliana Bruno, Eisenstein uses Choisy and the concept of a path, with the intention "to take the reader, quite literally, for a walk" (Bruno 2002: 55). The reason for the analogy, however, is made explicit in the introduction of the text:

> The word path is not used by chance. Nowadays it is the imaginary path followed by the eye and the varying perceptions of an object that depend on how it appears to the eye. Nowadays it may also be the path followed by the mind across a multiplicity of phenomena, far apart in time and space, gathered in a certain sequence into a single meaningful concept; and these diverse impressions pass in front of an immobile spectator. In the past,

[193] Both Giuliana Bruno (2002) and Anthony Vidler (2000) note that Eisenstein and Le Corbusier admired one another's work and exchanged ideas. In *Oeuvre Complète* (Vol 2: 24), Le Corbusier developed his concept of a 'promenade architecturale' by using his (1921-31) designs for Villa Savoie as an example, and comparing its spatial itinerary with the movement in Arabic architecture.

> however, the opposite was the case: the spectator moved between [a series of] carefully disposed phenomena that he absorbed sequentially with his visual sense. (Eisenstein 1938: 111)

Bruno suggests that the above reference to the 'immobile spectator' of film reveals the interplay between mobility and immobility:

> There is a mobile dynamics in the act of viewing film, even if the spectator is seemingly static. The (im)mobile spectator moves across an imaginary path, traversing multiple sites and times. Her fictional navigation connects distant moments and far-apart places. Film inherits the possibility of such a spectatorial voyage from the architectural field, for the person who wanders through a building or a site also absorbs and connects visual spaces. In this sense, the consumer of architectural (viewing) space is the prototype of the film spectator. Thus, as Eisenstein claimed elsewhere, the filmic path is the modern version of an architectural itinerary. (Bruno 2002: 55f)

That Eisenstein thinks as an architect shines through in his argument as a whole. It is tempting to suggest that his exploration of the 'path' also relates to, and even challenges, the Western convention of perspectival representation. His introduction refers to past traditions which enabled a mobile spectator to absorb sequentially using his visual sense. Eisenstein's argument follows:

> This tradition has been preserved in any child's drawing. Not only has the movement of the eye been given back to the action of the child himself moving in space, but the picture itself appears as the path along which a number of aspects of the subject are revealed sequentially. (...) As a representation of a pond with trees along its bank it appears meaningless until we understand its internal dynamics. The trees are not depicted from one viewpoint, as adults are accustomed to show them in a picture or in a single frame of film. Here the drawing depicts a series of trees as they are revealed along the path that the observer follows between them. If the line AB represents the path taken by the observer, then at any given point in the sequence one through nine each separate tree is disposed entirely »reasonably«: it represents a frontal view of the tree in question at each corresponding point on the path. (Eisenstein 1938: 111)

Eisenstein's knowledge of architectural drawings comes to mind when he describes examples of Russian architectural drawings, which have survived the fifteenth century: "For here the path is a movement across the plan, while the frontal views of the buildings are shown in elevation, seen from specific points on the plan." He presents yet another architectural example: "This can be seen even more vividly in the example of an Egyptian painting, representing a pond with trees and buildings around it, depicted according to exactly the same principle." (Eisenstein 1938: 111)

My emphasis on Eisenstein's architectural eye is aimed at suggesting a reading of Eisenstein's work, in which he uses cinema to deliberately create an extended mode of spatial representation. This, I suggest, he achieved through the use of montage, and neither painting, architecture, nor film in their conventional disciplinary form had the capacity to create a similar effect. Eisenstein's work clearly transgresses disciplines and allows concepts from one to inform another.

My own ambition to discuss mediated spaces as architecture is thus exposed. I believe that the spatial montage may be used as an architectural concept, bridging the disciplines and making way for the new possibilities to design hybrid spaces. Presence design, as a new discipline, emerges in conjunction with a broader societal shift, a movement away from the 'Albertian gaze', and towards new forms of spectatorship. Manovich asserts that "Alberti's window, Dürer's perspectival machines, the camera obscura, photography, cinema – in all of these screen-based apparatuses, the subject has to remain immobile." (2001: 109) Similarly, film theorists such as Anne Friedberg (1993; 2006), Christian Metz (1988), and Jean-Louis Baudry (1974), address a cinematic development which relies on the immobility of the spectator, seated in an auditorium.

Virtual reality applications, paradoxically, favour mobility, because the user needs to move in order to see an entire image. However, the user is restricted, as they are physically tied to a machine. Lev Manovich has pointed out that virtual reality is also one of few media that escapes the screen format, because it fills the viewers sight completely. There is no screen to talk about when "physical space is completely disregarded, and all 'real' actions take place in virtual place. The screen disappeared because what was behind it simply took over. […] Dramatic as it is, this immobilization probably represents the last act in the long history of the body's imprisonment." (Manovich 2001: 114)

In his discussion of representation versus simulation, Manovich compares frescoes and mosaics to Renaissance paintings. He points out that whereas the former provide an illusory space that begins behind the surface of an image (frescoes and mosaics are always an integral part of a wall, hence inseparable from a building), the latter modern painting as it emerges during the Renaissance is essentially mobile. It can be transported anywhere.

Manovich presents an interesting reversal: "Interaction with a fresco or a mosaic, which itself cannot be moved, does not assume immobility on the part of the spectator, while the mobile Renaissance painting does presuppose such immobility. It is as though imprisonment is the price for the new mobility of the image." (Manovich 2001: 112)

Still wishing to release the spectator from imprisonment, Manovich expects that cultural forms based on moving images, such as computer-based cinema will eventually evolve in the same direction as the Graphical User Interface (GUI). Following the thoughts raised by Walter Benjamin and Paul Virilio, Manovich compares the industrial processes of modernism such as Ford's assembly line with the sequential activities which made computer programming possible. Cinema followed this larger trend, replacing other modes of narration with a sequential narrative, an assembly line of shots that appear on the screen one at a time. Returning to his main example, Dziga Vertov's film *The Man with a Movie Camera* (1929), Manovich calls for a return to a spatial narrative that has played a prominent role in European visual culture for centuries.

Manovich has experimented with such cinema concepts in his commercial product *Soft Cinema* in collaboration with new media artist and designer Andreas Kratky (Manovich 2005). The work is presented as a 'cinema' in which human subjectivity and the variable choices made possible through custom software combine to create films that can run infinitely without ever exactly repeating the same image sequences, screen layouts, and narratives. A DVD is designed and programmed so that there is no single version of any of the films. All the elements – including screen layout, visuals and their combination, music, narrative, and length – are subject to change every time the film is viewed.

While Manovich does not use architectural examples here, he indirectly addresses the spatial organisation of spectators in new hybrid spaces in a manner that exposes the role of architecture in relation to new media. This is a subject that William Mitchell has approached on a number of occasions. Addressing what he calls the 'emerging paradox of digitally serviced space', Mitchell asserts three main points about the relationship between new technology and architecture: "(1) The better the digital technology is, the less obtrusive it becomes –disappears into your pocket and into the woodwork; (2) It is less necessary to organize buildings around technological requirements; (3) Without sacrificing functionality or comfort, architecture can return to an emphasis on air, view, and sociability." (2005) The architect Peter Anders expressed similar expectations in relation to the design presented at the beginning of the current chapter:

> We have an architect with her engineers, perhaps a client viewing a project which is partially physical, partially virtual. They are virtually situated within the same space, so to speak, the same cognitive space as the model and the architect. We can see an animation here. The merging between the physical and the electronic is as seamless as possible. (Anders 2001)

I have, in the above, attempted to point at a paradigm shift, triggered by developments in media and communications (both real-time and asynchronous), which has transformed

fundamental cultural activities and forced us to reconsider the concept of an aesthetic object as a self-contained structure limited in space and time.

As indicated earlier, mediated space is not new; literature, music, art, film and architecture provide plenty of convincing examples of mediated communication. Irrespective of the communication technology involved, it is the means by which it is presented that determine our understanding of an aesthetic experience. This is why it is fruitful to observe the concepts and strategies different practitioners have used. The conceptual and technological tools have varied throughout history, but upon taking a closer look, there are many similarities between the virtual spaces we presently encounter, and those from centuries ago.

Returning to my image of architects standing on a threshold, I now propose that architects are clinging to values in the architectural spaces – those we have tried to master over centuries – as we suddenly face a new, vast, and possibly open landscape. In order to incorporate today's hybrid spaces into our current discourse, to bring new spatial designs into our repertoire and to strengthen our practice as designers, we need to sharpen our existing concepts and tools. In Wittgenstein's words, one may say that this is a new language game, based on a revised set of rules.

VIEWING SPACES: MUSEUMS AND SPECTATORSHIP

Museums are also subject to revised language games. We may look upon museums and curatorial practices as visual practices in which a new form of spectatorship is currently being negotiated. As noted in Chapter 3, the museum provides a physical setting for the visualization of digital images and a site for interaction (Groys 2008).

The renegotiation of the relationship between a museum and its users (audience, spectators) was initiated two decades ago, triggered by a widespread dissatisfaction both within and without the museum profession, especially in the field of anthropology (Vergo 1989; Applegate Krouse 2006; Message 2006). This ongoing, self-reflexive approach is often referred to as *new museology,* and stresses the need for museums to be more responsive to their different audiences, and to include a more multi-voiced approach in their representations. In particular, it is suggested that museums further recognize the rights of those peoples whose heritage is included in exhibitions and that they should be consulted regarding the presentation and preservation of their heritage (Applegate Krouse 2006).[194]

> From early times, museums have presented themselves, in part, as akin to performances, happenings and theatrical experiences. These sometimes functioned as interpretative devices for collections and at other times as atmospherics and extra attractions. (Kotler and Kotler 2000; 2004: 180)

The quote above is taken from an article by Neil and Philip Kotler (2000). They refer to the American museum pioneer, Charles Willson Peale, who opened a museum in Philadelphia in the 1780s, promoting it as a place of 'rational entertainment'. By this he referred to a combination of designed settings and experiences for recreation alongside educational components. Kotler and Kotler emphasize the clever marketing approach: "Peale was also a showman who understood that visitors had to perceive an attraction to exist before they would be available for learning. The contemporary concept, 'edutainment', sets out to capture the same idea: attractive and entertaining presentation and design can facilitate educational goals." (2000: 180) Kotler and Kotler refer to many contemporary museums as 'hybrids'; they are collecting institutions, but also include story-driven and interactive learning and entertainment centres. Some museums call themselves 'history and science centres' so as to construct an identity as "broader-based learning centres rather than simply organizations devoted purely to objects and material culture". What distinguishes museums from non-museums, therefore, are the "collections of authentic objects and materials, assembled and conserved in accordance with the core purposes of preservation, enlightenment, edification and education, which museum staff are expected to accomplish." (2000: 181)

Ludmilla Jordanova refers to the representational practices of museums as 'coercive'. She applies the term 'realism' to museums that claim to be "literal, life-like, exact, telling it as it really was" (Vergo 1989: 33). Jordanova argues that the combination of realism and the 'illusion of unmediated vision' has been central to the development of several kinds of museums in at least two hundred years. Donna Haraway, who carried out a study of the primate hall in the American Museum of Natural History in New York, analyzed the design context of the exhibition space. She provides a detailed account of how museum displays were produced, the biographies of the main actors communicated, and overall design constructed multiple narratives. For Haraway, realism in museum contexts can be interpreted as the deployment of "technologies of enforced meaning" (1984: 30). Jordanova suggests

[194] In a collection of essays entitled *The New Museology* (1989), editor Peter Vergo called for a thorough re-examination of the role of museums within society and described the need for change in reference to *old museology* – also a recent practice – which he claims focused too much on museum methods and too little on the purpose of museums. Museums, today, Vergo writes, must do more than "merely display their treasures to the curious and make their collections accessible to those desirous of knowledge, but also actively engage in mass education" (1989: 2).

that, used in this sense, realism can express diverse forms of power: ideological, epistemological, aesthetic or political. Haraway's contribution, in turn, is to point to exactly what kind of power; for which social groups; and in relation to whom such power is exercised. The conclusion, writes Jordanova, is

> … a rigorous demonstration of a specific set of representational practices, which are architectural, taxidermic, and artistic (painting, sculpture, photography, film). It is precisely because these can offer a sense of unmediated vision (of the primate world) that they are central to the creation of scientific authority. (1984: 35)

Dioramas, staged narratives, dramatized performances and historic reconstructions (such as that of the 1897 Stockholm Art and Industry Fair, in the Mediated Museum example) are good examples of the above notion of realism, which support immersion in museum contexts.

There are contradicting views on the role of a museum. Ludmilla Jordanova suggests that museums operate under several degenerated assumptions, the most important of which, she says, is the "taken for granted link between viewing items in a museum and the acquisition of knowledge – the assumed function of museums. This is discernible in museum architecture, the selection and organisation of objects, display techniques, catalogues and advertisements. We believe, as people have done for at least two hundred years, that we learn things from museums." (Vergo 1989: 19) She writes that the kind of knowledge which is claimed to emanate from museums is an acquisition of a better sense of the past: "There is a theory of history implicit in such claims, and it hinges upon our ability to use objects as means of entering into and living vicariously in a past time. Visitors are required to assent to the historical authenticity and reality of what they see, while they simultaneously recognize its artificial, fabricated nature."(Vergo 1989: 25)

The origins of the contemporary museum can be traced back to classical times, to the Ptolemaic *mouseion* at Alexandria, which was both a study collection and a library.[195] This is often referred to as a repository of knowledge and a place where scholars worked. This is the concept of museum as an antique institution dedicated to the study of the Muses. In comparison, the concept of museum in the contemporary sense is a relatively recent phenomenon. The kind of public institutions, both publicly funded and publicly accessible, such as the British Museum in London or the Louvre in Paris, emerged in the latter part of the eighteenth century.[196]

An often quoted definition of the museum was first put forward by the American, Brown Goode, who refers to as the 'efficient' educational exhibition as a "collection of instructive labels, each illustrated by a well-chosen specimen in 1891" (Goode 1891).[197] Charles Saumarez Smith provides the following distinction: "the proper designation of the collection as a museum came at the point when it was acquired on behalf of the public and when it was assumed that the collection would not subsequently be in any way dispersed" (Vergo 1989:

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[195] According to the Oxford English Dictionary, a 'Musaeum' is referred to as early as 1683, as a modern institution which might contribute to the advancement of learning, in reference to an acquired collection of Elias Ashmole (*Philosophical Transactions of the Royal Society*).

[196] A decree was issued in 1793 by the Revolutionary Convention in Paris for the creation of the 'Museum of the Republic' at the Louvre. In 1796, the museum at the Louvre Palace was renamed 'Musée Central des Arts'. Ameri has pointed out that this marks the first in the appropriation of art by the newly construed entity of the 'public'. He notes that the history of the museum is thoroughly implicated in the history of the 'public' and its self-constitution as a sovereign entity (Ameri 2004: 62). Similarly, it was a transfer from a private collection to a public institution that led to the formation of the 'British Museum' in London in the mid-eighteenth century. Several scholars have traced the development of museums from collecting institutions to educating institutions (Weil 1990). The British Museum originates from the collection of Sir Hans Sloane, whose collection was first housed in Great Russel Square and later in Cheyne Walk, accessible to interested members of the public. Sloane had, as part of his will in 1749, arranged for the collection to be offered to the Parliament through purchase. After his death in 1753, the collection was installed for the benefit of the public in Montagu House in Bloomsbury. See Vergo 1989: 7.

[197] Brown Goode, G. 1891. The Museums of the Future. Annual Report to the Board of Regents of the Smithsonian Institution, quoted in (Miles 1988).

7). Smith describes four criteria of the museum culture which emerged in the second half of the nineteenth century: (1) collections on display should in some way contribute to the advancement of knowledge through study of them; (2) the collections should not be arbitrarily arranged, instead organized according to some systematic and recognizable scheme of classification; (3) owned by more than one person, and not a private individual on behalf of the public; (4) should be reasonably accessible to the public.

In order to interpret the contemporary museum as a setting in which new forms of spectatorship are negotiated, it is useful to look more closely at how this visual practice emerged. Museums for some time have struggled to find a balance between passive and active spectatorship. In the former, the museum is a site for storage in which objects are presented for passive observation; while the latter raises expectations on educational aspects of learning, for which curators are held responsible to trigger active reflection on behalf of visitors.

Vergo claims that museums emerged when wealthy and powerful people in Renaissance Europe looked beyond the boundaries of their city, state, region "in their quest for domination over nature and their fellow man" (1989: 2). The collections they gathered served the functions of a place to display wealth, power or privilege, but also as a place of academic study. Vergo writes, "This notion of the dual function of collections as places of study and places of display was inherited, both as justification and as dilemma, by the earliest public museums." (1989: 2)

Ameri has described the process in the sixteenth century in which dislodged paintings, statues, and other artefacts were collected, re-classified, and relocated. This led to the formation of two distinct museum practices over the following two centuries: the 'cabinet' and the 'gallery'.[198] To explain why the European elite was so concerned with authenticity, Ameri follows the transition from cabinet to museum. The preoccupation with authenticity was irrelevant to the gallery. Unlike the cabinet, the space of the gallery included the original as well as its reproduction. The institution of cabinets devoted exclusively to works of art (the German concept of 'kunstkammer') was, in a manner, an initial step towards consolidating the cabinet and the gallery into one homogeneous and exclusive space for art. However, Ameri concludes that the question of authenticity remained a divisive criterion in keeping separate the two modes of collecting and administering art for a long time.

The notion of a museum as a spatial guardian of authenticity is relevant to presence design. Located in a specific building and made available to visitors during specific opening hours, curators are obliged to provide the necessary clues and narratives to enable visitors to contextualize what they see. Were we to compare the means used by curators two centuries ago with the means available today, there is undoubtedly significant change in how artefacts are presented to an audience. Nevertheless, objects are still retrieved from an original context and placed in a designed architectural setting. Presence design creates the potential for objects to remain in the context of their original cultural heritage and thus reformulates the role of spectatorship by changing the temporal and physical foundations for design.

The architecture critic and historian, Nikolaus Pevsner, quotes Leo von Klenz, who in a 1816 wrote that a "museum is not a place for artists' training, an 'akademisher Kunstzwinger', but a place in which to show a number of treasures of art to all kinds of visitors in a manner to be worthy of the objects and to create pleasure in them" (quoted in Pevsner 1976: 126). Pevsner writes that for influential architects, such as Karl Friedrich Schinkel, it was

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[198] Amir stresses that the emphasis on the *authentic* in the cabinet is a salient feature of its practice and what sets it apart from the prevalent collection practice in the gallery. The gallery was often a long rectangular room, which served as a repository for paintings and statues gathered there for their aesthetic and iconographic value. The cabinet, on the other hand, was not meant as a place of exhibition or public display. On occasion, foreign dignitaries may have been taken there to make an impression, but for the most part, however, the cabinet was secluded, and inaccessible to the public: "The impetus behind the collection was not to make oddities, rarities, and singularities visible, but to render them invisible. (...) On display was not so much the objects in the cabinet, as the spatial control exerted over them – i.e. the collection." (2004: 64f)

important that the museum awakened, in the general public, an appreciation of the fine arts as an important parts of human civilization (Pevsner 1976: 128).

Architectural discourse centred on the museum is conceptually heterogeneous. Ameri presents two approaches to the architecture of the museum, suggesting that architects must consider "whether to spatially and experientially construe the museum to render art an object of study or an aesthetic object primarily. The former presumed penetration and analysis, the latter, distance and reflection." (Ameri 2004: 69) Architects thus played an important role in giving the museum an emphasis on 'public enjoyment and appreciation', and both the emerging perception of art as public and the logic of spatial design informed and characterized the art museum as a new and unique building type.[199] The concept of an art museum which emerged is one in which the art museum, like the cabinet before it, is a place designed for visibility and where no copies belong. "The copy that had a place in the gallery and even the museum that aimed to educate, has had no place in the museum that has aimed to 'delight'." (Ameri 2004: 70)

In reference to exhibitions, Peter Vergo criticizes traditional museum practices. Vergo's critique sheds light on the relationship between the concept of realism and the immersive design experience, which is guided and controlled by the curator:

> Objects are brought together not simply for the sake of their physical manifestation or juxtaposition, but because they are part of a story one is trying to tell. The 'context' of the exhibition confers upon them a 'meaning' beyond any significance they may already possess as cultural artefacts or objects of aesthetic contemplation. Through being incorporated into an exhibition, they become not merely works of art or tokens of a certain culture or society, but elements of a narrative, forming part of a thread of discourse which is itself one element in a more complex web of meanings. (Vergo 1989: 46)

For Vergo, it is obvious that all curators attempt to address an audience in some way, and claim that their aim is, in the broadest terms, educational. He finds that this practice deserves more reflection. Vergo promotes a reformed relationship with the spectator and challenges the curator to re-interpret their display of artefacts in the museum:

> Most of us, I think, share some notion that, through the medium of exhibitions, we are addressing the visitor, the public, however diverse that public may be...(...) Indeed, it would be a very strange kind of exhibition-maker who was indifferent to whether the visitor 'got anything' out of the exhibition or not. Moreover, we would all probably agree that one of the functions of the maker of exhibitions is to offer some measure of elucidation of the material which is being exhibited – even if, in the exhibition itself, such elucidation consists of little more than simple identification, with perhaps a brief note of the provenance of the object displayed, its date, or the material of which it is made. (ibid.)

For Vergo, the problem is that museum practitioners disagree on the best way to achieve a change. At one end of the spectrum there are proponents for whom the object itself (a work of painting, sculpture, or graphic art) is of paramount importance. They believe that understanding is essentially a process of private communion between an observer and a work of art. At the other end of the spectrum, we find the advocates of what Vergo labels 'contextual' exhibitions, where the object displayed is or relatively little intrinsic significance, instead regarded purely as an object of contemplation. Its presence within the exhibition is justified by its importance as a token of a particular age, a particular culture, a particular political or social system, as being representative of certain ideas or beliefs (1989: 48). Vergo stresses that spatial design is important in engaging an active spectatorship:

> In the creation of 'efficient' educational exhibitions, the relationship between selector and designer is clearly of crucial importance. Unfortunately it happens all too often that exhibition designers see the kind of high-profile, prestige show so common today as a vehicle for realising their own aesthetic ambitions, rather than an opportunity for devising the

[199] Ameri also follows the intriguing process of acquisition of 1829, in which Wilhelm von Humboldt, then chair of the court-appointed Museum Commission in Berlin, attempted to fill 'true and significant gaps' in the art collection by suggesting that copies be purchased. This idea was rejected after heated debates. (ibid.: 69)

> most telling, most instructive, most advantageous display of the objects in question. (...) It is the design of the exhibition, the layout of the material, and the context which the designer creates for that material, just as much as the actual selection of objects, which 'tell the story', and this 'story-telling' rôle carries through into the smallest details: the choice of display lettering, of materials and colours for wall-coverings, the design of the catalogue, of the poster, of related advertisements and publicity material. (Vergo 1989: 54)

Alongside Groys and Vergo, I would conclude that a reformulation of museum practices is to a large extent dependent on how a curator, like other designers, treats concepts such as authenticity by using the available design tools. While it was formerly the case that objects were made visible and accessible to an audience by being presented within an allocated time and space, from which pedagogical expectations could be assumed, it is possible today to design museums in such a way that objects and visitors remain separated, yet are made accessible. The *Mediated Museum* example illustrates one way of providing remote presence to cultural heritage environments. I believe museums remain an interesting area for future studies within presence design research, since the reformulation of spectatorship is closely linked to architectural design in combination with the possibilities offered by new media.

The formulation of spectatorship in the arts: Participation and real-time art

Above I have addressed the concept of spectatorship in museums. A further aim in discussing this context is to direct the discussion towards architecture. A museum is both a building and an institution. As such, new structures of vision are exposed and negotiated within its space. In Chapter 3, I discussed how active forms of spectatorship in early cinema were modelled on the interactive vaudeville theatre. With reference to Benjamin and Brecht, I noted the emergence of a more political practice, which reformulated spectatorship in drama and literature. I will elaborate on these participatory and performative practices before turning to architecture, stating their relevance to an extended architectural practice.

As part of the establishment of trust in mediated spaces, as noted earlier, users will negotiate witnessed mediated presence amongst themselves, by actively engaging in a mediated interaction and assessing the spatial boundaries. In my discussion of the *Mediated Museum* example, I asserted that museum visitors must be drawn away from the role of passive observers, and become active participants in extended architectural spaces. The mousetrap was one metaphor which illustrated techniques for drawing a spectator into conversation. Examples to illustrate this form of active participation are more easily found in related visual practices, rather than in architecture. Let me use some examples.

The 'art happenings' that took place in New York in the late 1950s, later termed 'happenings' by the performance artist and art critic Allan Kaprow. Kaprow described how viewers were fused with the space-time of these performances, and therefore lost their identity as 'audience' (Kaprow 1966; 2006: 102). He made a parallel between the happenings and the cubists' collage technique: both created new art forms by introducing irrational juxtapositions and new elements to visual art. For Kaprow, the 'action collage' illustrated a relationship between the painting and its surrounding: "The pieces of paper curled up off the canvas, were removed from the surface to exist on their own, became more solid as they grew into other materials and, reaching out further into the room, filled it entirely" (Kaprow 1966: 165). Others have also observed Kaprow's treatment of the spatial. Je is concerned with how a "canvas evolves through collage to assemblage and environments" (Carlson 1996: 97; cf. Bigsby: 48; Jacucci 2004: 56). Happenings, for Kaprow, developed through the complexity of the relationships between objects, environments and the involvement of those present. In effect, there is no audience, no spectators. The happenings may be regarded as a way to erode any barriers between the work of art and the audience, and to eliminate the spatial division between the audience and the artefact. As noted by Bigsby: "The barrier between art and the real is thus eroded, or rather the dualism which leads to such a distinction is rejected by the deliberate inclusion of everyday objects." (Bigsby: 48)

Kaprow himself declared his objective "to release and artist from conventional notions of a detached closed arrangement of time-space. A picture, a piece of music, a poem, a drama, each confined within respective frame, fixed number of measures, stanzas and stages, however great they may be in their own right, simply will not allow for breaking the barrier between art and life". (Kaprow 1966: 193)

Kaprow's 1966 book, *Assemblages, Environments and Happenings*, provided seven rules, which I will list in order to draw a comparison with the parallel rules that Gordon Pask proposed for cybernetic performative installations (see Chapter 3). With reference to 'happenings' Kaprow states that:

> (a) The line between art and life should be kept as fluid, and perhaps indistinct as possible; (b) Therefore, the source of themes, materials, actions, and the relationships between them are to be derived from any place or period except from the arts, their derivatives, and their milieu; (c) The performance of a Happening should take place over widely spaced, sometimes moving and changing locales: (d) Time, which closely follows on time considerations, should be variable and discontinuous; (e) Happenings should be performed once only; (f) It follows that audience should be eliminated entirely; (g) The composition of Happenings proceeds exactly as in Assemblages and Environments; that is, it is evolved as a collage of events in certain spans of time and in certain spaces. (Kaprow 1966: 188-189)[200]

In theatre and drama, engagement with the audience can take many different shapes. Shakespeare, for example, had the habit of closing a play with a direct address to the audience, as noted by Hilton (1987: 129). In the closing lines of 'Troilus and Cressida', we are reminded of the spatial setting and wooden interiors of the Globe theatre:

> As many as be here of pander's hall,
> Your eyes half out, weep at Pandar's fall;
> Or, if you can't weep, yet give some groans,
> Though not for me, yet for you aching bones. (v. 10. 46-49)

Julian Hilton points that reception theory – the study of the process by which meaning is generated by the reader through his/her relation to a text – is seldom integrated with theatre and performance analysis. 'Dramatic engagement' with an audience, writes Hilton, is twofold: "There is an onstage conflict of forces which constitute the plot of the drama, and there is the engagement with the audience in an imaginative act of constructing a possible world." (1987: 132) Hilton points at a number of contradictions inherent to the concept of 'performance' as a 'product of the meeting of performers with an audience'. He states that first, it is not the physical meting of performers and audience as such which matters, but rather their shared consciousness of the performance. This consciousness, writes Hilton, is not dependent on there being an audience at all: "It stems from the representational aspect of the actant, in which the performer is his own audience." Whether real or imagined, the signals produced by the performers lead to a disjunction between what the performers intend and what the audience interprets as the intention. By necessity, the event becomes a subject of divergent interpretation.

Second, the presence of an audience does not turn a 'real' event into a 'performance'. If that were the case, writes Hilton, any street accident would be regarded a performance. Instead, the performers' deliberate intentions and statements may be assessed as 'performance'. Under these terms, Hill notes, the audience will not "test the performance as such, over which they have little control, but rather test the validity of its perceived meanings within the wider context of culture as a whole." The latter is related to a third problem, which concerns the definition of 'audience'. Hilton refers to Brecht's political regard for theatre as a tool to 'educate the masses', through which he incites people to action outside

[200] Kaprow's elimination of the audience echoes Rousseau's reversal of roles, by which the audience becomes the performance. At the end of his letter to d'Alembert on spectacles, Rousseau describes how the actors are not actors in a conventional sense, but contribute to a re-enactment of a ritual, reliving and celebrating the memory of an original event, that may be repeated by generation after generation (Rousseau 1904).

the theatre. In Hilton's words, "performances turn audiences into performers, by making them want to go out into the street and make real that which had been presented as theatre." Resounding Kaprow's proposed rules above, Hilton stresses the transformational process by which an audience "…no longer feels itself to be passive, merely watching, but senses itself to be the action, to have so fully intervened in the gaps and indeterminacies of the performance as to have broken down the distinction between the stage and the auditorium, the performer and the spectator." (1987: 132f)

Hilton uses the concept of 'tuning in' to describe the process by which an audience passes "through a threshold of awareness from off-stage consciousness into performance consciousness" (ibid.: 133). This is comparable to the transformational process by which an actor enters a role. Hilton observes that the process of tuning in may take as long as twenty minutes and remarks that "not until then am I fully tuned in to the signals being transmitted to me." A similar process of tuning out, Hilton writes, continues long after a curtain call, "leaving audiences in a different state of consciousness for hours or even days afterwards" (ibid.134).

Art critic and theorist Jack Burnham is the author of several influential texts from the late 1960s, which concern 'Real Time Systems'. Burnham analysed the work of contemporary artists as part of its social and political context, using such observations to describe a larger transition from an object-oriented to a systems-oriented culture. Burnham was interested in conceptual artists who attempted to integrate their work to what he referred to as the "real world (...) of politics, money-making, ecology, industry and other pursuits." (Burnham 1975: 7). He contributed a systems perspective on cultural practices, applying this perspective to communities, companies, and other matrixes involving human interaction. As Kester notes, in retrospect Burnham's assumption that politics exists in a 'real world' as opposed to the art world is questionable. His concept of 'duration' combined with a larger analysis of arts social context, however, remains significant (Kester 2004: 208).

The performance art and happenings of the 1960s often fused several disciplines. For example, the 'Fluxus' performance events grouped art and music. Introducing the 40th anniversary of the *Fluxus Performance Worksbooks* (2002), editors Ken Friedman, Owen Smith and Lauren Sawchyn date the first examples of what were to become 'Fluxus event scores' to John Cage's Experimental Composition classes in 1957-59 at The New School in New York City[201]. In these classes, different artists, such as George Brecht, Al Hansen, Allan Kaprow, and Alison Knowles, created art works and performances in musical form. Brief verbal notations accompanied each event, a form of representation which later came to be known as a 'Fluxus event score'. As notations, these may be described as proposals, propositions or instructions, and were published in different formats, such as boxed collections, pamphlets and catalogues (Friedman et al. 2002: 1).

Below is an example of 'Fluxus event score' from 1965, by Alison Knowles, called 'Newspaper Event':

> Newspaper Event.
> Performers who speak at least five
> different languages use newspapers or
> books in the different languages as
> scores. They read the texts in time and
> volume according to the instructions of a
> composer. (Can go from very soft to
> extremely loud and stop, soft-loud-soft
> again, varied tempos, etc.) (in Friedman et al. 2002: 72)

Can such notations be compared to architectural drawings, as representations with the underlying intention of a subsequent – or simultaneous – action? In the following section, I

[201] For a description of The New School for Social Research, see e.g. Johnson, 2002. *The New York Schools of Music and Visual Arts*. (New York: Routledge)

will observe the similarities between participatory and interactive forms of spectatorship, as presented above, with contemporary design and performance strategies.

Writing in 1998 and reflecting on the implications of Burnham's 'systems thinking' pf the late 1960s for to the 'techno art' of the late 1990s, critic Mitchell Whitelaw finds Burnham's writing striking. Burnhams work, according to Whitelaw, is still pertinent, due to its "apparent currency, its anticipation of contemporary concerns. In 1968 he discusses the history of the 'cybernetic organism' as artwork, and the philosophy of self-organising systems in relation to sculpture. Twenty-five years before the inception of the Web, he discusses an art embracing 'realtime information processing'" (Whitelaw 1998). Whitelaw is interested in the systems approach that Burnham explored in his early writing in many ways predates/preambles contemporary theoretical turns. Whitelaw compares Burnham's predictions to the contemporary "technological revolution which has delivered to our desks more 'computing power' than an entire late sixties tech-art show, has also delivered us into the high-level interface of consumer computing". What emerges with Burnham, he continues, "is a sense of a moment in history when artists, working with and without high technology, were engaged in a post-representational, post-object practice concerned with provoking an awareness of the real as an extensive, relational, dynamic network of processes" (1998). Whereas Burnham's term was 'post-object', Whitelaw notes that we often use 'virtual object'. He concludes:

> Rather than a node in a wider system, a throughput device, the computer constructs itself internally as a little object- world, a mechanism four pixels deep which we use to produce more objects: documents, images, sounds. When we use it as a real-time device or part of an open system, we negotiate with its serial protocols, hardware channels; unlike Levine's, the computer interacts with its environment in very meagre ways. This is reflected in the hermeticism of the hype around virtuality and cyberspace, and consequently in that large slice of tech-art concerned with these "spaces". Uncritically pursued, virtuality amounts to a kind of anti-systems practice: above all it's about forgetting the system, the concrete infrastructure, for a frantically overproduced internal space. Its acceptance is fed by a broader feeling in culture currently, a sense of retreat and defensiveness, an armouring of the subject and a desire for a safe haven, a turning inwards. (Whitelaw 1998)

Spectatorship and participation in architecture

> In 1839 it was considered elegant to take a tortoise out walking. This gives an idea of the tempo of flânerie in the arcades. (Benjamin 1999: 422)

Walter Benjamin, throughout his *Arcades* project, addresses spectatorship in architecture and urban design (Benjamin 1999). A city such as Paris shapes one's way of looking, and when Benjamin marvels at the nineteenth century flâneur, it is the architecture of the emerging city, and the architecture of the flâneur, that he addresses most. Susan Buck-Morss has described this work as an examination of nineteenth-century neoclassicism, "an ideological attempt to represent the unbroken pedigree of bourgeois civilization and the eternal verity of Western imperial domination" (1995: 26). Stuart Hall describes Benjamin's spectatorial subjectivity as a distinct way of looking at 'beautiful and expensive things', stressing the self-consciousness of the flâneur, which "not only established a series of looks at the displays of goods and the detail of the shop interiors, but also invited the consumer to look at themselves amidst this spectacle – often literally, through catching sight of their own reflection in a mirror or a shop-window." (Hall 1997: 334) Similarly, Baudelaire spoke of the spectator as a 'passionate spectator' and 'a prince who everywhere rejoices in his incognito' (Hall 1997: 334).

Spectatorship is not a term often used in architecture. With its aim to establish a physical (re)configuration of practice, it can however be argued that architecture, in one way or another, always represents, articulates, or frames the relationship between spectators. In other visual practices, however, the awareness of spectatorship, as well as gaze, is more

prevalent. In the following, I will propose that spectatorship is a useful tool in presence design. To do so, I will distinguish between a passive and active form of spectatorship.

For Roland Barthes, a reader of a text is as important as the author in constructing meaning. In *The Death of the Author,* Barthes suggests that every act of reading creates a new text which may differ from the intentions of the author (1977: 142ff). Jonathan Hill draws a parallel to the relationship between 'author' and 'reader' in architecture: "The architect and user both produce architecture, the former by design, the latter by inhabitation. (...) Architecture is the gap between user and building, just as literature is the gap between writing and reading" (Hill 1998: 140). But, as Hill notes, this notion does not prevail in architectural discourse, where the user is rarely addressed:

> It is highly noticeable that, while the authority of the 'author' and the activities of the 'reader' are discussed outside the architectural profession, they are absent inside the profession, which still maintains that the user is a stable, centralized and passive subject, if of course he or she is acknowledged at all. (Hill 1998: 3)

For Hill, the term 'user' is a problematic in architecture. He considers using 'occupant', or 'occupier' but opts for 'user', because this term implies "positive action and the potential for misuse". (ibid.) Hill does not use the term 'spectator', but he refers to Walter Benjamin, who does.[202]

Hill implies that architects are afraid of users and writes that "the presence of the user is perceived as a direct threat to the authority of the architect". He supports this argument by pointing to a well-known fact in architectural photography: "The absence of people from the architectural photograph is the physical manifestation of a deep fear of the user within the architectural profession. For the architect, the occupant is an intruder, analogous to dirt (...)" (1998: 139). Architects, says Hill, are more interested in 'form', than in 'space', because "…whereas space is occupied, form is not" (1998: 150). Influenced by Barthes', Hill elaborates on the problematic user-architect relationship in a more recent book, *Actions of Architecture: Architects and Creative Users*. Here he explores the notion that architects, in order to preserve a hierarchy related to professional authority and skill, actively deny a creative role for users (Hill 2003: 7ff). Hill suggests that architects, in effect, define themselves against this passive a role of the user. He presents two underlying assumptions, which explain how such a hierarchical relationship is maintained within architectural discourse: (1) The denial of the user, i.e. the assumption that a building need not be occupied to be recognized 'as architecture. (2) The control of the user, i.e. the assumption that architects can predict use, thus legitimize they can assign a more or less passive role to the user.

Architects, Hill says, have also developed strategies to ignore users and to turn them into abstractions. He puts forward three types of user which prevail: the passive, the reactive, and the creative user:

> The passive user is predictable and unable to transform use, space and meaning. The reactive user modifies the physical characteristics of a space as needs change but must select from a narrow and predictable range of configurations largely defined by the architect. The creative user either creates anew space or gives an existing one new meanings and uses. (Hill 2003: 28)

One may discuss whether Hill's notion of user is maintained in architecture, and to which extent cultural differences play a role. In Scandianvia, for example, users are given a relatively active role in the design process and participatory design methods are well implemented (Westerlund 2009). However, one could argue this still reduces the user to limited participation, confined to very specific phases in the design process, and is yet another

[202] Benjamin addressed the new forms of participation which followed from the change in media by comparing cinema with art: "The fact that the new mode of participation first appeared in a disreputable form (movies) must not confuse the spectator (...) art demands concentration from the spectator. (...) A man who concentrates before a work of art is absorbed by it. He enters into this work of art the way the legend tells of the Chinese painter when he viewed his finished painting." (Benjamin 1936; 1992: 239)

strategy to falsely involve the user. By following the procedures of the professional 'experts', the user remains an onlooker, passive rather than participative.

What is a *spectacle*, really?

The spatial organisation for performances and spectacles has occupied architects throughout history. What is a spectacle, really? Tertullian wrote that spectacles were places for "seeing and being seen" (as quoted by Kyle 2007). Donald Kyle writes,

> For the ancients, the human eye had its own light, and they believed in the power of the outward gaze and the impact of arresting images. Ancients did not consume their sport and spectacles passively and anonymously in dark movie theaters, or sitting in easy chairs watching television in their homes. They had to attend events and pay close attention. Ancient spectatorship was more public and interactive. (Kyle 2007: 18)

Thomas Downing has observed the architectural staging of spectatorship in the eighteenth century architectural design of theatres. He shows that new architectural designs sought to reshape the experience of spectatorship. One example is the elimination of machines that provided 'magic and enchantment' to a performance. Such devices enabled gods and goddesses to fly above the stage; these were replaced by an architectural reformulation, where humans rather that gods were placed on stage, new seating arrangements brought the audience closer to the performance, and other design criteria were used to foster the perception of 'truth' and 'reality'. Downing argues that the architectural staging of spectatorship was instigated by Diderot, who wrote that, "the machinery driving the special effects of opera should no longer constitute the central interest of the spectacle because knowledge itself had undergone a profound shift" (Downing 1995: 54).

What Diderot, in his philosophy, characterized as a move from 'enchanted' metaphysics to 'real' philosophy should, says Downing, "find its analogue in the realm of theatrical and operatic representation, bringing it into the 'real' world" (Downing 1995: 55). Upon seeing an entire audience in tears after the staged death of Socrates in a play, Diderot apparently exclaimed: "Quel naturel! Quel vérité!"[203] It was the affective experience of the spectators as projected by the architecture, and a kind of community that occurred in the shared space, which Diderot admired. Downing cites examples by architects Claude-Nicolas Ledoux, Charles-Nicolas Cochin, to show how architects altered and exerted control over the space in which representation occurred:

> By carefully manipulating the space of spectatorship (this manipulation being, after all, the function of design), theater architecture attempted to control a series of more or less contiguous spaces: the stage, the auditorium, and eventually the area surrounding the theatre. Segregated, yet linked by the architecture, these different spaces would form a mimetic continuum, connected by an architectural vision that sought to express an ideal of community. (Downing 1995: 59)

Illustrating the above with a design by Charles-Nicolas Cochin for a theatre from 1765, Downing stresses that Cochin attempted to achieve a high level of inter-visibility and communication among spectators. Through various spatial and acoustic measures, such as the terraced placement of loges, Cochin formed a narrow elliptical space without pillars, which put the spectators in relative proximity to the actors. Cochin's proposal also allowed spectators to hold conversation between different level of loges, in contrast to prevailing design conventions, which often directed the visibility axis from spectators in one loge to the loge opposite. This inclusive theatrical space reinforced the idea of an interactive community of spectators, where "[t]he stage, no longer isolated at the end of a rectangular hall, would instead be brought into the space inhabited by the audience; and the audience itself –

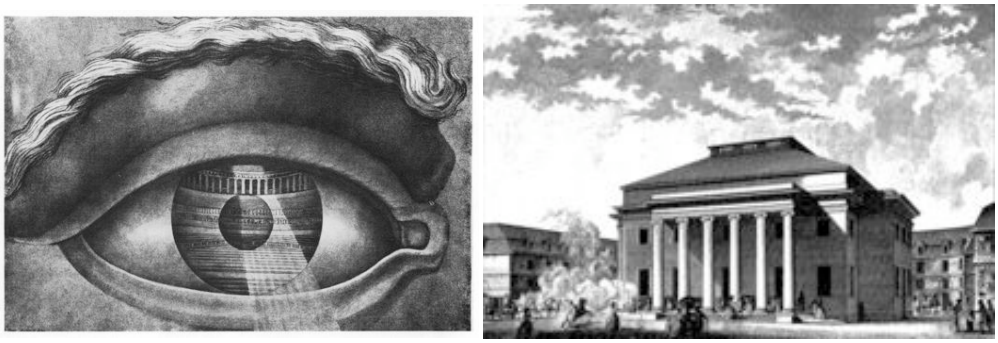
[203] I translate this as: 'Unbelievably natural!' and 'What truth!' Diderot in 'De la poésie dramatique', as quoted by Downing (1995).

particularly its female half (...) – fans out in a public display that defeats the traditional parceling of multiple intimate boxes." (Downing 1995: 57)

Downing writes that Cochin sought an architecture that offered a new role to the audience, yielding a spatial unity, which on the one hand included the actor and the stage, and on the other hand, the lip of the stage was intermediate to the audience.[204] The proscenium arch (in French, the *avant-scène*) marked the symbolic boundary between two spaces, and was an important feature that maintained a sufficient distance between the spectator and actions on the stage. This was kept in order to encourage a certain 'truth-effect'. Critics of the time had noted how spectators who were seated too close to the action were unable to frame it as 'real'. Downing writes, "Cochin emphasized that combats had previously taken place at the front of the stage precisely so that the spectator could see that they were not real; but this effect was no longer considered desirable." (ibid.: 58) His point is that for Cochin, Diderot, and other theorists, 'truth' in theatre concerns representational relationships between the spectacle to the audience, the audience and the spectacle, and between spectator and spectator:

> When Cochin argues that the combat should be farther away from the spectator, he does not alter the relationship of the theatrical representation to that which it represents (the combat), but he does modify the relation of the spectator to that representation. Cochin's project reveals a desire to refashion theatrical representation, not by changing the mimesis carried out through dramatic events, but by altering and exerting control over the space in which the representation occurs. (ibid.: 59)

Claude-Nicolas Ledoux's well-known theatre in Besançon, seen below, is a good example of such a reciprocal relationship between the stage and the community of spectators.



184. 'Le coup d'œuil' (left) by Claude-Nicolas Ledoux, drawing as part of the designs for a theatre in Besançon, France (right). We look into an eye, located on the stage, to see the seats and the rear of the theatre reflected in its pupil. Downing writes: "It is unclear whether the beam of light illuminating the rows of seats comes from the back of the theatre, striking the eye that looks back towards the spectators, or whether it is the result of an invisible machine enclosed within the recesses of the eye." (ibid.: 60) (Images from Ledoux)

As in a Greek theatre, a semi-circle organises the spectators, and there is no division between loges to interrupt the continuity of vision. In his C*oup d'œil*, he figures the importance of the proscenium as a framing and opening to the space of fiction, the *encadrement*. Downing stresses how the eye figures into the importance of the proscenium, whose role is to prepare the opening of the theatre, to serve as an encadrement, to frame the stage and act as a transition from the salle to the theatre itself. Anthony Vidler has shown how Ledoux creates an unprecedented degree of visibility, and complicates, even collapses, the relative position of stage and spectator. In his book *Writing of the Walls*, Vidler quotes Ledoux: "The eye was indeed the 'first frame' through which the world was seen, and remains the frame of vision for each individual member of the audience." (Vidler 1987: 177)

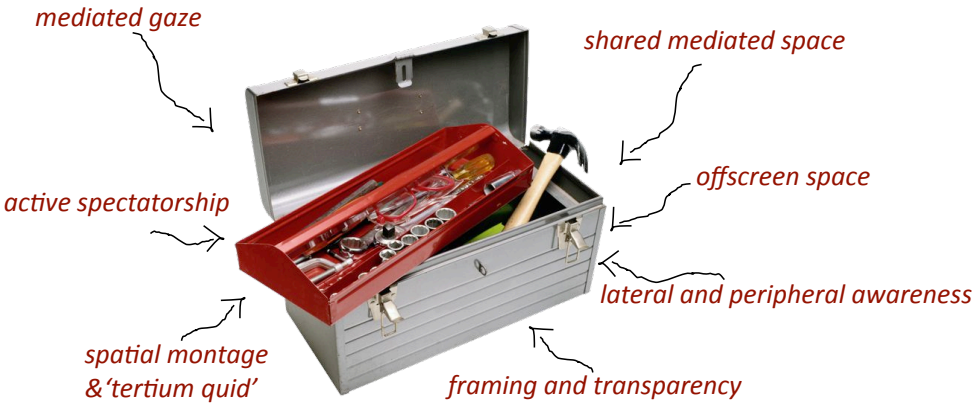
[204] This architecture of the late eighteenth and early nineteenth century is referred to as *architecture parlante* for its emphasis on 'speaking forms' which would arouse in the viewer, not just appropriate feelings, but an understanding of a building's function. See Markus & Cameron 2002: 24f.

Theatre thus has affinities to the museum; in both we can examine, historically, the different ways that narrative and spatial design are combined to engage an audience. This is a notion of architecture imposing a spatial order on any given activity: making the audience passive or active, to different degrees, by the spatial organisation of the narrative or performance. The task of the architect or designer is often to ensure that the spatial design supports the theatrical performance, artistic content, or learning experience at hand. To this we can compare the design of a space that supports mediated dialogic interaction. This means that presence designers must learn from how designers in related visual practices have previously treated aesthetic concepts, such as an active spectatorship.

chapter 8 assembling the conceptual toolbox of presence design

8

DESIGN FRICTIONS



185. The conceptual toolbox of presence design

The previous chapters addressed the potential for an extended architectural practice by analyzing shared mediated spaces from an architectural perspective. The discussion in this closing chapter serves to more closely establish the link between presence design and architectural discourse.

In 'assembling the conceptual toolbox of presence design', which is the task of this chapter, the role of my design examples is made explicit. As snapshots from a prototyping process spanning ten years, they have given meaning to the range of concepts I developed in the process. To state this more clearly: I do not refer to the design prototypes as exemplary of presence design, rather, I suggest they illustrate strategies that are used by presence designers, and for which certain design concepts play an important role. These are selected aesthetic concepts that I have found useful, based on my personal design experiences from the design-led research I have engaged in. In line with previous research seeking to define the prerequisites for *(witnessed) mediated presence*, my studies confirm that the experience of mediated presence is negotiated as part of a process to establish trust and confirmation from the remote party/parties (IJsselsteijn 2004; IJsselsteijn & Riva 2003; Nevejan 2007).

My design-led research showed that mediated spaces can provide sufficient audiovisual information about the remote space(s) and other person(s), allowing the subtleties of nonverbal communication to inform the interaction. I found that in designing for presence, certain spatial features have an effect on the user's ability to experience a mediated *spatial extension* (sense of a *shared mediated space*), which can facilitate the experience of mediated presence. My conclusion is that certain spatial concepts (or design tools) play an important role in the process in which trust is negotiated, hence with an impact on knowledge sharing.

As we interact in real spaces, we may be more or less aware of the surrounding spatial design and what an architectural order actually imposes on the interaction. A negotiation of trust nevertheless occurs as part of the interaction. An architect will, to the best of his/her ability, seek to design a spatial support that facilitates the collaborative practice at hand by using the range of design tools and architectural elements available. A subsequent spatial analysis and articulation of the design may shed light on certain implicit power structures that could tacitly impact the interaction. What I have shown is that very similar spatial mechanisms operate in terms of human interaction in mediated spaces, and that in the process of negotiating trust that takes place, a remote party will specifically seek to interpret the spatial extension. From the point of view of a user, this represents a noteworthy difference between *real spaces* and *mediated spaces*. A real space can be (often is) taken for granted (a user does not always reflect on the spatial extension or design, for example, of a

meeting room), because the individual does not need to assert that the other party is present in the same location. In a mediated space however, as shown by previous research, the negotiation of trust that leads to mediated presence also relies on a spatial understanding of the remote space, as a shared space, extended from one's own. Thus it can be argued that spatial design plays a greater role in mediated spaces than it does in real spaces. My discussion in the previous chapter offered an example of the counteractive effect of using 'picture-in-picture' in video-conferencing. In a real space, it would not matter very much if a mirror were placed before me while I was in conversation with someone. In a mediated space, however, such a mirror (or a picture-in-picture display of myself) would counter the illusion of a spatial extension.

As is the case in architectural practice and design generally, it is the way different design tools and architectural elements are combined that characterizes a remote presence situation and determines its qualities. Numerous design combinations are possible and will, in effect, enable mediated presence. While I never aimed to define specific criteria for (witnessed) mediated presence to occur, I want to point at certain spatial tools and discuss their role in the negotiation of trust that takes place in mediated interaction.

By acknowledging that certain features are related to spatial design, the presence designer can monitor them and, in effect, seek to reduce the 'friction' that otherwise may inhibit the experience of mediated presence. This notion of a 'friction' relating to spatial design was introduced in Chapter 4, as part of my discussion on the potential for knowledge sharing and remote presence in collaborative work practices. My expanded use of the term *design friction* is an attempt to identify concepts related to spatial design which, unaddressed, may be said to impose friction and thus impact negatively on the experience of presence. The label *design frictions* thus summarizes my contribution to presence research: It consists in identifying such design concepts that may benefit future practitioners and presence design research.

Hence, into my proposed *conceptual toolbox of presence design*, I presently place the following spatial design tools: *mediated gaze, spatial montage, active spectatorship, mutual gaze, shared mediated space, offscreen space, lateral and peripheral awareness, framing and transparency*. Each of the concepts were presented and discussed in the context of related visual practices in the earlier sections of the thesis, and I have commented on their relevance to presence design and to an extended discourse in workplace design.

Acknowledging, thus, the limitations in terms of design and the challenges and constraints in creating a fusion of architectural and technical design, I conclude that my design examples from prototyping were useful in supporting the arguments presented in the thesis. In sum, I suggest the examples perform the following functions:

(1) each example has enabled (witnessed) mediated presence and can thus illustrate the meaning of *shared mediated spaces* as an overarching concept in presence design;

(2) each example may serve as an illustration of the selected design concepts, and can be used to reduce *friction* in presence design;

(3) each example is sufficiently integrated to a context of use and to an overall architectural design to be interpreted as a spatial extension or as part of a spatial interior/exterior, i.e. as an *architectural element* rather than as a *technical device*;

(4) as a whole, the series of examples in their context of design prototyping demonstrate the potential for an extended practice in architecture.

In conclusion, if remote presence can be achieved from the architectural environments and limitations that the prototyping examples display, there is reason for continued design-led research and practice regarding the integration – or fusion – of presence design and architectural design.

One further reflection that I wish to raise concerns architectural discourse, which I suggest, may constitute a kind of friction itself. As part of my final discussion, therefore, I will elaborate on the topic of an extended discourse, by observing two dilemmas that reside within architectural discourse and that I propose have produced a certain amount of resistance to viewing mediated spaces as architecture. Throughout the chapter I discuss these dilemmas under the following two headings: 'Architecture as immaterial artefacts' and 'Architecture as generative design', summarized below. After this, one final section presents my proposals for future presence design research.

Architecture as immaterial artefacts

The friction I discern within architectural discourse relates to a noted resistance to incorporate the design of virtual and mediated spaces into the domain of architects. My discussion in Chapter 4 specifically observed the field of workplace design and I showed that in spite of major changes relating to collaborative work practice, the office as such appears unchanged. I discussed the developments which, in a fairly short space of time, have affected the nature of work and dramatically changed the meaning of office work today (e.g. the emergence of the network society, advances in media and communication technologies – or, in short, *presence design)*. What may be classified as a paradigm shift in society, since human practices in many contexts have been altered, appears to have had limited effect on architectural design relating to work and learning practices.

In light of the above, I here discuss the relationships to *materiality* and *immateriality* in architectural practice and discourse. I refer to these as problematic relationships in which the material has formed the basis for discourse in architecture, and contributed to 'a resistance' to including virtual and mediated spaces in the realm of architecture and spatial design (or with Wittgenstein: seeing mediated spaces as architecture).

Considering my earlier proposal, put forward in Chapter 3, that architects and artists already were presence designers, such a resistance may be considered a paradox. Due to an 'empiricist stronghold' on architecture as a discipline, however, I argue that the problematic relationship remains unresolved and that resistance may persist. The argument is also supported by my earlier discussion, in Chapter 4, of the *presence-in-person paradigm* in workplace design and the proposed distinction between a *co-presence scenario* and a *no-presence scenario*.

To structure the discussion I present two mechanisms which, in combination, sustain the noted resistance and preserve the assumption that mediated and virtual spaces are 'other spaces', different and inferior to 'real spaces': (1) the architectural drawing being *the tool for mimetic representation par excellence;* and (2) the architectural view that *the material is superior to the copy*.

Architecture as generative design

In view of an extended discipline, I do, however, propose an alternative approach by considering the possibilities provided, for example, by generative design strategies. Repeating the argument that these design strategies are already well in place, since they are in use in related visual practices and point to the origins of presence design (as described in the section in Chapter 3: 'Interactive architecture in its cybernetic setting'), I propose that architects are standing on the threshold (of the realm of presence design), but that there is no reason to linger: the conceptual tool-box for presence design is fully equipped and at hand. I also propose, using the concept of the *tertium quid,* that mediated spaces may be referred to as *generative design*, i.e. as architectural design, *generating* reality rather than *representing* reality.

Who are the presence designers, if not the architects?

The final section of the thesis provides my reflections and proposals for future research on this topic of how presence design may develop as a field and who will represent it. With a

direct address to this double audience I have wished to inform by my design-driven approach, I ask: who are the presence designers, if not the architects?

While my own study can be considered an exploratory approach to the design-related aspects in a broad and diversified field – ranging over media space research, cognitive science, (tele)presence research, interaction design, ubiquitous computing, second-order cybernetics, and computer-supported collaborative work – it has been an attempt to inform presence research by presenting a contribution from the perspective of architectural, artistic and visual practices. I have argued that discourse on the subject is currently separated by disciplinary boundaries and identified a conceptual gap: a lack of aesthetic concepts immanent to architecture and related visual practices that I, to some extent, have tried to fill. My suggested reformulation of *presence research* to *presence design research,* is a direct proposal that future research on the experience of presence and mediated interaction includes, rather than excludes, design aspects such as those raised here. Continued research to specifically address the design context which precedes the individual experience of remote presence is therefore regarded as fruitful.

Furthermore, my proposed conceptual toolbox for presence design could be developed through continued design-led research, possibly resulting in a practical handbook for all involved in the design and use of spaces where knowledge sharing and learning are central concerns.

Throughout this thesis it has been my interest to relate presence design to architectural design, and I presently repeat the arguments put forward earlier stating that architects are very well suited to engage in the design of mediated spaces. However, my point is not that architects, only, ought to engage in presence design, but rather to propose that architectural practice be extended to incorporate mediated spaces and that presence design become a shared aesthetic practice involving several professional skills.

ARCHITECTURE AS IMMATERIAL ARTEFACTS

Introducing his book *Architecture: the Subject is Matter*, the architect and theorist Jonathan Hill writes that in architectural discourse, it is the materiality of buildings that counts: "Traditionally, architectural matter is understood to be the physical substance of buildings, and architects employ a limited palette of materials such as steel, glass, brick and concrete." (2001: 2) He also notes that "architects further the idea that they alone make buildings and spaces that deserve the title architecture" (ibid.).

The consequence, Hill argues, is that architects are caught in a vicious circle and a complex relationship to materiality and immateriality: "in order to defend their idea of architecture they often adopt practices, forms and materials already identified with the work of architects, and thus learn little from other disciplines." Whereas other visual practices have informed each other, architecture thus seems prone to resist change. Although drawings and texts also can be considered important architectural artefacts, Hill notes that: "The practice of architects is yet to be influenced by ideas that have been so liberating in art". He suggests that to the definition of architecture "one can add films, telecommunication networks, computer programs and bodies at the very least. Architectural matter is not always physical or building fabric. It is whatever architecture is made of, whether words, bricks, blood cells, sounds or pixels." (ibid: 2f)

The above suggests that mediated spaces and presence design may be assimilated to architecture and the aim of this section is to discuss why, in architectural discourse itself, there may be friction that discourages such a development.

Architect Peg Rawes calls for an extended understanding of the term *material*. She writes:

> Materiality is the stuff of architecture. Materials and their properties organise both the minute and the monumental architectural feature in the built environment; from the microchip to the high-rise. Architectural materials may range from the plastic or solid to the virtual, dynamic or sensory. In turn, these modes of materiality are developed into architectural forms by the technologies and methods that constitute the design process. (2001: 208)

What is the state of architecture in the era of digitalization, really? Why is there a resistance to including new media in the first place? Further, how are the new digital or virtual spaces approached and understood, from the perspective of media theorists and those outside architectural discourse? As Hill observed above, architects tend to believe that 'space' is a concept which belongs to architectural discourse. However hard this may be for architects to admit – myself included – space is a key concept in many other disciplines! In effect, is it appropriate to question whether architects primarily foster and nurture this concept, in the era of digitalization. Are architects significantly involved in the conceptual development of 'space' today?

Hybrid and immaterial artefacts, such as digital image files, were discussed in Chapter 7 with reference to contemporary museum contexts. I addressed the transition from material to immaterial artefacts in the visual arts with reference to Walter Benjamin. The issue which now must be addressed is why, if a process of change has taken place in so many other visual practices, immaterial artefacts have not been assimilated to architectural discourse? Why are mediated spaces not automatically perceived as architecture? In his vision of a reformulated museum practice incorporating immaterial artefacts in exhibition design, Boris Groys handed the responsibility to the curator. What is fruitful in Groys' description, is that his curator, in fact, deals with both *immaterial* and *material* artefacts: with real and virtual spaces. In Chapter 3, I mentioned that the curator is referred to with similar authority as that of the architect as a designer of *real spaces*. As formulated by Groys, the curator is in charge of designing the mediated spaces for spectators at the receiving end: "the aesthetic value of a video installation consists primarily in explicitly thematicizing the potential invisibility of the image, the viewer's lack of control over the duration of his attention paid in the exhibition space, in which previously the illusion of complete visibility prevailed. The viewer's inability to take complete visual control is further aggravated by the increased speed at which moving images

are currently able to be produced." (Groys 2008: 89) I could use an analogy and compare the curator's relation to the spectator with the architect's relation to a user/spectator. The curator is faced with the challenge of a new form of spectatorship and the visualization of digital images. What about the architect, does s/he face similar challenges?

Hill stresses that the immaterial is as important to architecture as the material. Architects refer to Renaissance examples by Alberti, Borromini, and Palladio precisely for their aesthetic mastery in combining material and immaterial qualities. However, it is materiality that has formed the basis for discourse in architecture: "Architecture is expected to be solid, stable and reassuring – physically, socially and psychologically. Bound to each other, the architectural and the material are considered inseparable." (Hill 2006: 2)

Could it perhaps be explained in terms of Benjaminian *aura*, that the materiality of buildings as such makes them unsuitable for 'mechanical reproduction'? Hardly so, if we observe the development of the building process throughout modernism as well as recent, quite successful attempts to industrially produce customized buildings. As noted by Branko Kolarevic, our current technologies for mass-customization "allow for the creation and production of unique and similar buildings and building components, differentiated through digitally-controlled variation." (2003: 53) In addition, the concept of virtual modelling is inherent to the architect's professional skill. In fact, virtual tools and virtual representations constitute the very essence of architectural practice and one could easily argue that architects, in many ways, are well prepared to take on the challenge of a juxtaposition of material and immaterial space(s).

The complex relationship to materiality and immateriality has contributed to a resistance towards including virtual and mediated spaces, as illustrated by the development of workplace design in the previous chapter. I showed how, in a fairly short space of time, new tools have affected the nature of collaborative work practices and the meaning of office work today. Nevertheless, the office itself appears unchanged. Few of the developments which in other contexts have dramatically altered human practices, have had a corresponding effect on the field of workplace design.

Empiricist narratives in architecture – and in digital media discourse

Technoromanticism: Digital Narrative, Holism, and the Romance of the Real is a book by Richard Coyne, published the same year as Hill's (2001), which approaches similar issues but from the perspective of digital media. Coyne describes how certain digital narratives have focused on the division of space, based on the assumption that there are two kinds of space(s): space as it exists objectively in the world of matter, and space as we experience it (Coyne 2001: 78). With this division, space becomes a construct for the imagination, something that gives access to spatial experiences. What follows is a distinction, which is common among architects and geographers, between space and place. A 'space' is regarded as reducible, an entity which is possible to describe mathematically and represent through drawings such as plans and maps. 'Place', on the other hand, is memory qualified and imbued with value (Norberg-Schultz 1971; Pickles 2004). This division is supported by the development of CAD/CAM modelling, in which: "computer representations of objects, such as buildings, trees, and hammers, are commonly constructed on the assumption that there is an independent object world and a mapping, or correspondence, between an object and its description in a computer system" (Coyne 2001: 86).

A similar binary distinction (*dualism*) marks Platonic, Neoplatonic, Romantic, Berkeleyan and technological idealism, and various forms of empirical realism. This is visible in digital narratives, according to Coyne, where there is always a 'real space' to which 'digital' or 'virtual' space will be in opposition.[205] William Gibson, for example, coined the term

[205] For Coyne the difference between Plato's world of ideas and cyberspace differ in the way that the latter is "a fusion between the pure realm of cognition and the empirical data of sense experience, incorporating the "smallest details of here- and now existence." The techno-idealist, says Coyne a little later, "adds computer technology to the relationship. What is real is what the ego is connected to on a computer: real life is life on line."

'cyberspace' as an imaginary electronic space that could be 'entered', in contrast to the space in which bodies – 'meat' – are located (Gibson 1984).[206] As noted by Spiller, this other spatial entity becomes an active participant in Gibson's stories (Spiller 2002: 7).

Other narratives object to the notion of dualism and refrain from a distinction between the actual and the experienced. Coyne describes the philosophical origins and points at different political agendas frequently embedded in a narrative. However, let me turn to architectural discourse, which appears to be closely connected to empirical realism. Empiricism, writes Coyne with reference to Locke, assumes a distinction between the 'real' or 'primary' qualities, which can be studied by science, and their 'secondary' or 'apparent' qualities, which are those perceived by our human senses (2001: 80). One may, for example, distinguish between the real physical colour of an object as determined by a scientific measurement system, and the sensible colour, as we perceive it in different lights. Texts by Charles Jencks, like Christian Norberg-Schultz an architect and theorist, illustrate how deeply empirical realism rests within architectural discourse. Writing in 1995, at the peak of the discourse around postmodernity within architecture, Jencks claims:

> Most scientists believe they are discovering something objectively real and that reality 'obeys' or is 'subject to' these laws [...] I also believe this transcendent realm exists. Its importance is not only to set the universe in motion, and sustain it but, as far as we are concerned, to be a measure and standard for us – independent of us. (Jencks 1995: 164; cf. Coyne 2001: 80)

Of the several variants that exist of the empiricist narrative, representational realism is of interest to my discussion here. Coyne quotes Bertrand Russell: "there is a physical space in which physical objects have spatial relations corresponding to those which the corresponding sense-data have in our private spaces. It is this physical space which is dealt with in geometry and assumed in physics and astronomy." (Russell 1912; 2007: 23) Following classical empirical model theory, a computer representation requires some notion of what is to be represented, and a language for representing it. The understanding that an architectural model or a computer system enables the representation of space thus assumes an objective spatial realm that can be represented.

In empirical realism, such objectivity exists in the 'reality' of a situation; the actual spatial location to which people and buildings conform and about which there can be uniform agreement. The consequence, according to Coyne, is that in terms of digital narratives, 'cyberspace' becomes an(other) imaginary space, a world of appearances where all is possible and where spatial and temporal rules can be 'violated'.[207]

This means that virtual space is discussed in opposition to or in reference to real space. Further, it is always the language of real space which is used to describe this perceptual, imaginary cyberspace world. Coyne writes that: "As a technology for the reproduction, manipulation and transmission of patterns, the computer provides a means of manipulating space and creating it anew, setting in place new spatial laws, extending the scope of space, and drawing us into it, or at least absorbing our essential, collective selves." (2001: 87)

Based on the above, I suggest that an 'empiricist stronghold' in architectural discourse has prevented architects from assimilating virtual and mediated spaces into the definition of architecture. I will in the following discuss possible explanations for this resistance by observing two mechanisms which, I argue, sustain the assumption that mediated and virtual spaces are 'other' spaces and of inferior kind, compared to 'real space':

(1) the architectural preference for *the original as superior to the copy*.
(2) the architectural drawing as *the tool for mimetic representation, par excellence*.

(2001: 64f) He describes how certain digital narratives focus on the division of space, that there are two kinds of space: spaces as it exists objectively in the world of matter, and space as we experience it: practically versus subjectively (ibid.: 78).

[206] The widely accepted opposition between 'meatspace' and 'cyberspace' is subsequently used by many different cyberpunk writers, frequently with reference to Gibson. Throughout his 1984 novel *Neuromancer*, Gibson often refers to 'meat' in this sense, however, the specific term 'meatspace' does not appear.

[207] Coyne uses the term 'cyberspace' instead of virtual space (2001: 87).

Combined, I suggest these mechanisms have contributed a complex relationship to materiality and immateriality in architecture.

Although the empiricist stronghold on society as a whole is in the process of being dismantled, a conceptual 'problem' still prevails and maintains the situation. As shown above, the dominating digital narratives are rooted in empiricist dualism. This means that the concepts through which cyberspace, digital spaces, or virtual space are addressed and understood imply a spatial division. Thus the spatial and visual design concepts currently used by designers are inadequate; arguably, there is also a need for conceptual development in digital media discourse. The heated debate which followed Dibbell's *A Rape in Cyberspace* regarding decency and behaviour in virtual reality compared to 'real life': 'VR' versus 'RL' behaviour (Dibbell 1993: 36ff; cf. Brennan 2004). Here, cyberspace is characterized as 'the Wild West', where the dominant players lack adequate tools for spatial thinking and design which, following Coyne, makes it possible to violate the spatial laws of cyberspace.

Later in this section, I put forward a possibility by which the noted resistance is released, and which allows the assimilation of mediated spaces into the definition of architecture. Derrida and fellow poststructuralists developed new conceptual tools which enable a juxtaposition of space(s). In Chapter 7, I approached the concept of spatial montage in a different way with reference to Eisenstein, but will now discuss the poststructuralist view of montage in relation to mediated spaces in order to observe how, in presence design, it is a conceptual tool that enables virtual spaces and real spaces to coexist.

Richard Coyne writes that the realist/idealist debate generates meaningless propositions, such as 'there exists an independent reality'; or 'computers can represent reality'. He describes a *pragmatic realism* which does not divide the universe into the real and the perceptual but rather

> … affirms the proximal, the shared, the embodied, repetition, and the ineffable, without appealing to the mind as the mirror of nature, or dividing, the universe into the real and the perceptual. Pragmatic realism does not require the objective existence of rules, depend on scientific procedure as the final arbiter of what is real, or rely on concepts of correspondences between knowledge and the world. It also leaves the matter of a divide between ourselves and an object world open and contingent. Moreover, it embraces the pursuit of the real in its discourse, acknowledging that it is just as interesting to examine how it is that we come to require the real as it is to discover what that reality is like. (Coyne 2001: 87f)

The architectural preference for the original as superior to the copy

> "I sometimes wish that truth should so far literally prevail as that all should be gold that glittered, or rather that nothing should glitter that was not gold." (Ruskin 1849, 1979: 53)

On the steps of the British Museum, John Ruskin had an experience which made him hesitate about the authenticity of the real: "I have made it a rule in the present work not to blame specifically; but I may, perhaps, be permitted, while I express my sincere admiration of the very noble entrance and general architecture of the British Museum, to express also my regret that the noble granite foundation of the staircase should be mocked at its landing by an imitation, the more blameable because tolerably successful. The only effect of it is to cast suspicion upon the true stones below, and upon every bit of granite afterwards encountered." (Ruskin 1849: 51) I have, in Chapter 3, introduced the topics of originality and copy in cultural heritage and museum contexts.

Ruskin's annoyance above is triggered by the un-demarcated and simultaneous presence of both the real and the copy and the fact that the fake is successfully carried out, which threatens Ruskin's grip on the reality of the real. The distinction for Ruskin between the reality of the real and its mere representation is an assumed causal link between the appearance and substance of the real.

Ruskin recommends that the mock should be framed and separated from the real – as a means of preserving its 'effect'. It is easy to recognize how influential Ruskin's approach has been for the emerging visual practices of the twentieth century, including that of architectural

discourse. The Ruskinian comparison of the 'representation' with the 'real' is based on the assumption that representation is always, merely, a second-order reality as in the simile of Plato's cave. Echoing Benjamin's concept of cult value discussed earlier, Ruskin believed that the value of art was directly linked to the agency of an artist's hands. Forms which are reproducible are worthless and only the original bears the decisive seal or impress. To use Ameri's phrasing, "there can be no substitute for the original, because what would be irretrievably lost in the transaction is the original" (2004: 83).

Whereas Ameri used this as an argument to explain why the art museum is no place for duplicates, only for originals, my aim here is to point at the complex relationship, in architectural discourse, between immateriality and materiality, which I argue, is founded on similar assumptions of the representation as lesser than the 'real' and 'original'. Ameri stressed the importance of architecture to provide, establish, and define safe places and sites where representation may occur. Museums and cultural heritage sites are such examples where authoritative control is executed as well as contested. Architects, as designers of buildings, have contributed to establishing the museum as a 'safe-house' providing a 'framing for originals'. Ameri writes that "the art museum, as an institution and a building type, exiles the inherent representational characteristic of the real in the name of mimesis and art to the museum" (2004: 84). With the widespread use of digital images today, the museum becomes "the indispensable reserve to the economy that regulates the widespread and free circulation of images outside the museum." Thus, the museum building and architecture preserve the notion of the original as superior to the copy.

The architectural drawing as *the tool for mimetic representation, par excellence.*

Architects, it may be said, excel at modelling in virtual worlds. In a design practice, those involved in a design process communicate and conceptualise by modelling in virtual worlds, hence they create artefacts by negotiation and collaboration. But even if architects are very accustomed to handling virtual spaces, these are usually a phase in the design process, not expected as the final outcome. Since all architects live with the frustration, disappointment, and financial uncertainty of projects which are never realised (competition proposals, for example), the realisation into built and material form provides the necessary proof of success. The term 'design' comes from the Italian *disegno*, which means 'drawing'. Mario Carpo has shown that the architectural drawing was the key that unlocked the status of the architect and distinguished the architect from other adjacent artistic professions in the fifteenth and sixteenth centuries (Carpo 2001). As noted by Hill, the authority of the architect has since relied on the architect's command of drawing over building and the distance of drawing from building: "two ideas in uneasy partnership" (2006: 61). Similarly, the architectural theorist Adrian Forty writes:

> In the new division of labour that took place in the fifteenth and sixteenth centuries, what above all set the new genus of architects apart from the building trades was their command of drawing: it both made possible the separation of their occupation from building, and because of drawing's connection with geometry in the newly discovered science of perspective, gave architecture a means to associate itself with abstract thought, and thereby give it the status of intellectual, rather than manual labour. (Forty 2000: 30)

Forty dismisses the notion of the drawing as the 'architect's only medium', stressing that also language is used throughout a design process as a whole (drawing, building and experience) and not only as a means for a final description of experience. He distinguishes, however, between the power of language as a precise system which establishes differences, whereas a drawing evokes only itself and no opposites. Language, according to Forty, has the ability to maintain ambiguity and metaphor whereas a drawing is precise. Drawings, however, are experienced 'at once', unlike language, which is experienced as a sequence (2000: 18f).

I suggest that architects and designers can make good use of their experience from modelling in virtual worlds, as they presently stand on the threshold of presence design. There are two different ways of looking at a design process through which an artefact evolves. To compare these approaches, I will label them as the (1) Step-by-step design

process and the (2) Two-step design process, which architects are more familiar with. The first is a design process where a prototype is developed and, little by little, develops into a functional artefact, which may be material or immaterial. The second design process is distinguished by its two phases. From initial programming and design a virtual model results, which during its second phase is executed and represented in material form (e.g. a building or furniture). As long as it is expected that the model will be executed in built form, a two-step design process is required. This is the underlying distinction of the 'performative' and 'generative' design strategies from second-order cybernetics which I have presented earlier and that I will discuss in the following.

Thus, modelling in virtual worlds, which previously was a means of communication and conceptualisation in architecture, may now be the final product of a design process. This also affects the role of the architectural drawing. In prototyping cases where a mediated space becomes more and more elaborate, the final product is a new kind of artefact in which material and immaterial elements are juxtaposed: drawings for execution in 'brick and mortar' are no longer needed.

ARCHITECTURE AS GENERATIVE DESIGN

From the above, it follows that the architect can be seen as a master of mimetic representation through history. Carpo's eloquent study of Sebastian Serlio's work in sixteenth-century Rome provides excellent examples of the role the drawing plays (Carpo 2001: 42ff). By drawing lines on a paper or a computer display, an architect assumes a realization in due time. Hill writes that the architectural drawing depends on two contradictory assumptions: (1) "that design is an intellectual and artistic activity distant from the grubby materiality of the building"; and (2) "that the drawing is the truthful representation of the building, indicating architects' mastery of the seamless translation of ideas into matter" (Hill 2006: 55f). Stressing that what architects build are drawings, models and texts, not buildings, Hill suggests that "architects often try to deny the gap between representation and the building because it questions their authority. The drawing is a projection in that an invisible line links a point on the paper to one on the building. But the journey from one to the other is not direct." (ibid.)

Robin Evans has similarly referred to the drawing as a 'bridge between imagined and real worlds' (Evans 1997: 153ff). In writing about the power of buildings and their texts, Thomas Markus and Deborah Cameron point out that it is not the texts and drawings themselves that have the agency to shape reality. As discussed in Chapter 3, it is rather an effect of an active spectatorship from which people take certain actions (Markus & Cameron 2002: 65). Like Carpo, they show that while different professions developed in the sixteenth century, two different forms of representation also followed: writing and drawing.

The expected transparent translation from words and drawings into concrete, built form, however, requires contribution from other consultants and entrepreneurs. This realization is dependent on the efficiency of the design and building processes, which may allow what was designated on paper – as a matter of time – to be realized in 'real space'. Consequently, an understanding of architecture as representation suggests that all the tools surrounding the architectural practice (drawings, computer models, 3D-visualization software, and video mediated communication technology) have similar functions – to provide a referential language serving to translate, reproduce or realize imaginary 'virtual spaces' to 'real spaces'. Computers and communication software have effectively speeded this process, but also preserved this view of a transparent transition process: a design and building process that enables what I draw on my computer to be quickly shared by others involved in the same aesthetic practice of design and building. It is important to stress that these tools are not just invisible translators or agents that transparently reproduce and mediate, but that they impact on the outcome.[208]

Hill sees the potential for a different approach which radically changes architecture in that the conventional stages of the process – conception, realization and usage – dissolve: "CAD/CAM aligns thinking, drawing and making, so that the architect can more accurately claim that to be in command of drawing is to be in command of building." (2006: 61) He suggests that computer-aided design fosters a new role for architects; by "[b]ringing building closer to drawing and the ambiguities of architectural authorship to the fore, CAD/CAM questions the history of the architect and division of labour that recalls the thirteenth century as well as the twenty-first" (ibid.).

This approach to conceiving and understanding architecture can be illustrated with John Frazer's concept of 'an evolutionary architecture' (1995; 2001). Informed by second-order cybernetics, Frazer summarized a theory of architecture as a dynamic system that continuously interacts, mutates and evolves in an iterative manner facilitated by computers. This was also addressed in Chapters 2 and 3, where I discussed second-order cybernetics in relation to architecture. Teaching at the AA in London, Frazer found reasons to apply

[208] Cf. Kittler (1990); Bolter & Grusin (2000); Bolter & Gromala (2003), who have explored to what extent new digital media transparently translates – or in fact remediates.

cybernetic thinking to the field of architecture: "At the outset the investigations were concerned with the implications of rule-based generative systems. Emphasis was placed on the intelligent processes underlying design thinking with the intention of developing approaches to architecture where the rules are so configured that the program itself could take over the evolution of design." (Frazer 2001: 644)

By 1992, Frazer had design prototypes that responded in different ways to an external stimulus. Two points are noteworthy in his description of these hybrid artefacts. One is that they were not models intended for later execution, but prototypes that could be further refined. The second point refers to the communicative capacity of these prototypes, not necessarily to serve audiovisual communication and exchange between people, as intended in my own design examples from presence design, but to generate a response from another location in other ways. Frazer explains: "The communication between devices was controlled by a genetic algorithm which modified the program according to ability to produce an appropriate response to the environmental conditions." (2001: 644) The practical potential for architecture was demonstrated with the development of a 'responsive skin' for a building in Kuala Lumpur in 1993. It is not uncommon that, for example, sun shield panels are automatically activated in response to changed daylight, but Frazer's design appears to be founded on the possibility for reciprocal communication.[209] I have used this to show an example of architectural design resulting in a hybrid artefact which, it can be argued, exists in two locations at the same time.

Generative design

Evolutionary architecture addresses the fact that user needs are changing and unpredictable. This interests Hill because it means "that a building can absorb or adapt to reflect changes in use" (2006: 63). He comments that a similar notion of 'flexibility' in terms of building is noticeable in the mid-twentieth-century reactions to functionalism. A functionalist principle assumes that the architect creates a system that caters to the users' future needs. Evolutionary architecture can, following Hill, be seen as an extension of this tradition, with the addition that here, the architecture is as responsive to its environment as it is to the architect or user. Hill makes the following triple statement by which he summarizes the user-architect relationship and what I have previously referred to as an *active spectatorship*:

> In functionalist architecture there is but one designer, the architect, and the user is passive. In flexible architecture the architect is reactive more often than creative. In evolutionary architecture the architect is not the only designer. (2006: 63)

Thus it is no longer a question of a building serving the user or the user serving the building; rather, they co-operate and communicate. One can also note that computers are involved in the initial process as well as throughout the life of a building. In summary, 'design' no longer refers to a process (usually involving computers) before construction, but is continued throughout the length of a building's life. Without the division between a design phase, a construction phase, and a user phase, a building or an artefact is more effectively demonstrated as it is in use rather than represented on architectural drawings. Its inherent qualities are activated, or *generated*, by a combination of technical and spatial design, juxtaposing material and immaterial elements. As is the case with mediated spaces and mediated buildings, such artefacts may stretch across time zones and it is difficult to pinpoint their exact location, when extended between different geographic locations.

This approach, where architectural design may be said to *generate* experiences rather than act as *representations of* an intended outcome, is often referred to as *generative design*. I introduced this theoretical framework in Chapter 2 and pointed at examples in Chapter 3 to

[209] Frazer writes: "Work on living systems and artificial life led to the development of a set of codescripts for the evolution of structure and a genetic architectural language for encoding them. The computer model was now developed to a point where it was able to execute a form generating process in a simulated environment. Evolutionary space and time were compressed so that the model could evolve over a large number of iterative cycles. The theoretical framework had now been developed to the point where it could be demonstrated interactively." (2001: 645)

illustrate the crucial involvement of architects in the formative years both of second-order cybernetics and of ubiquitous and tangible computing to support collaboration. Supported by my own examples in Chapter 4, the discussion has served to substantiate the argument that generative design strategies are applicable to architecture. I want to stress that the design examples and prototypes used throughout this thesis may equally be said to *generate* (mediated) presence. In effect, this would more accurately define mediated spaces than if we were to refer to them as 'representations of reality'. They are, of course, representations in the sense that video cameras have captured images from one location and that are transmitted and displayed in another by means that can be referred to as a fusion of media technology and spatial design. However, the resultant *mediated space*, from the *spatial montage* of one real space and one or more virtual spaces, is a *tertium quid* that actively triggers an experience of spatial extension from the perspective of a user or spectator located inside real space and facing a virtual space. We may also say that the design generates a spatial extension that is not easily defined by conventional architectural representation, which is why I conclude that mediated spaces may be referred to as generative design. This approach provides a different possibility for the analysis of mediated spaces. By seeing them as generative design, as part of a continuous design process which includes the users in different locations, they are understood quite differently from a conventional artefact: as an execution in material form of, for example, an architectural drawing. As I have attempted to show, the experience of a mediated spatial extension is part of a process to negotiate trust and presence that actively engages a spectator. This makes it less fruitful to analyze a mediated space as if it were an executed building.

In contrast to materialist and structuralist views where representational languages are assumed to express an underlying reality, poststructuralist theory suggests that representation 'performs reality'. In spite of the similarity, poststructuralist theory has different roots to cybernetic thinking, and emerges from linguistic and textual analysis. In *Of Grammatology*, Derrida demonstrates 'reference' in entirely new ways by interrupting, juxtaposing and superimposing utterances, words and images of real experiences so as to complicate "the boundary that ought to run between the text and what seems to lie beyond its fringes, what is classed as the real" (1981: 42).[210] In effect, postmodernist art turned in the direction of Dadaist methods of collage and photomontage: "To write means to graft. It is the same word" (ibid.: 355). Gregory Ulmer has called Derrida the 'Aristotle of montage', showing that the method used for the deconstruction of mimesis is *montage* (Ulmer 1985: 87). He compares Derrida's work to what Aristotle did for 'mimetologism' in Poetics by providing a theory of tragedy (mimesis) and a method (formal analysis) for the study of all literary modes.[211] Ross King has similarly compared the dialectical augmentation of the Derridean montage with Benjamin's 'dialectical images' (King 1996: 125f). He notes that the distinctive human condition which unfolds from Derrida's deconstruction of mimesis is one of emptiness and one which differs profoundly from other representations of space.

Throughout this thesis, I have shown that concepts such as montage, which are rooted in related visual practices, may be fruitfully applied to mediated spaces as architectural design, but that discursive mechanisms can also hamper change and development.

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[210] Derrida set out to deconstruct 'mimesis' as the imitation or reproduction of the supposed worlds of an 'other'. He argued against 'mimetologism', which is how he referred to representation as captured by the logocentrism of Western philosophy which – since Plato – privileges the referent over the material sign. Writing and other media become mere 'vehicles'.

[211] By nailing Derrida's *Glas* as the exemplary text of poststructuralism (where the structuralist link between signified and signifier is no longer privileged), Ulmer provides a theory of montage (grammatology) and a method (deconstruction) for working with any mode of writing.

CONCLUSIONS AND FUTURE RESEARCH: WHO ARE THE PRESENCE DESIGNERS, IF NOT THE ARCHITECTS?

My attempt to address presence design as architecture is brought to a close by this section. With an explicit emphasis on my design-led research experience, I have addressed and synthesized a range of conceptual tools throughout the thesis. These were interwoven with critical reflection on design examples – *mediated spaces, windows and walls* – which have emerged from different contexts of use and design.

With reference to Donald Schön's concept of the *reflective practitioner* (1983), I combined images and reflections in the form of collage, characteristic of the architect's attempt to make herself clear by juxtaposing visual and textual references, with reflections from personal experiences and examples from professional discourse. Several of the examples from related visual practices are used as analogies, this being a common strategy among practitioners as a means to breach a conceptual gap in an interdisciplinary context. The analogies also function as 'textual extensions', allowing me to extend the text by referring to other sources, with more detailed descriptions of the examples.

Throughout this thesis, I have argued for an extended architectural practice, suggesting an extended theoretical discourse is also bound to follow. I presented a set of conceptual tools which were discussed and tested on the design examples and prototypes which emanate from my practice. My ambition in performing such a critique of my own work was threefold. Firstly, I wanted to test the validity and applicability of the concepts, as part of a potential theoretical discourse in presence design. Secondly, the critical perspective forces me into a position of distance in relation to my own work. This is a form of *dédoublement*, using Diderot's concept,[212] which I believe is necessary for the theoretical articulation of design-led research. Finally, the interwoven form of writing has allowed me to put forward critical reflections and discuss limitations in terms of design. This is particularly relevant in considering that many of the examples are design prototypes to which I have contributed myself. Many more ambitious designs can be expected in the future, should architects encompass mediated spaces and the full potential of presence design to support interaction across time and space.

As I now approach the end of the thesis, it is time to conclude whether I have succeeded in arguing that designing for presence is a concern for architectural practice; and what might be the grounds for a new, transdisciplinary, practice and discourse in *presence design*.

Before I go further, however, I want to make a few remarks on a level which concerns all who commission, design and use mediated spaces, based on my design-led research. Chapter 4 illustrated the potential for change, in terms of work and learning practices, procedures and behaviour. I now want to make a point regarding the circumstances in which such changes occur; and on which parties the responsibilities for such change rest, using the concept of *aesthetic judgement* introduced earlier. Let me take the example of changed practices in terms of academic dissertations and recruitment processes that many universities have adopted. By enabling contributors to participate remotely, using what is at hand in terms of conferencing equipment (video and teleconferencing), universities primarily aim to fix the processes and to facilitate participation from international experts. Among other benefits, reduced expenses and lesser environmental impact are expected from less travel.

My examples served to illustrate that in spite of an ambition to contribute technical support *(*merely as *transparent vehicle,* in light of the discussion in the previous section), the existing videoconferencing facilities also impose a new spatial order. I argue that new

[212] Diderot used the twist or 'dédoublement' in his philosophical dialogues (e.g. 'The Paradox of the Actor' and 'Rameau's nephew') to point at the ability to critically reflect at the same time as being emotionally absorbed within the performance of a role by telling the story through a second voice: 'Lui' is used throughout the text to refer to Rameau's nephew', while 'Moi is a new designation used to enable a role as judgmental observer at a distance to the event (Diderot 1963; Diderot 1994; cf. Josephs 1969: 163; Hughes 2000). The term is frequently used in relation to the articulation of practical knowledge (e.g. Göranzon & Florin 1992; Göranzon 1995)

practices are currently introduced and implemented at universities without the necessary reflection on how the new format will affect the interaction and academic practice as such. A doctoral dissertation is modelled on procedures which have evolved over a very long period. In most universities, the space in which the public and scientific scrutiny of a doctorate takes place is specifically designed to support a certain procedure and language game which has evolved over a long time.

As my example of recent mediated dissertations at KTH in Stockholm showed, the experimental mediated dissertation may be proven effective, yet underlying qualities may be lost in the process. Some of these can be related to spatial design, but often remain unaddressed and unarticulated. The ability to assess and analyze spaces, mediated or not, is founded on aesthetic judgment and skills that architects may develop through reflective practice. An ever-so-well-intended mission to alter existing language games must be subject to critical reflection, for example, from exposure throughout a participatory design process.

The point I raise is that university managements, to date, have few dialogue partners concerning these arguably spatial matters. They have so far, to a large extent, been regarded as technical matters, but as I have shown: *the experience of presence is significantly related to spatial design*. Hence my rhetorical question: Who are the presence designers, if not the architects? Where else can management seek equivalent analysis of the spatial qualities of mediated spaces? Recruitment and examination processes are critical activities within academia and these activities always take place somewhere; to further assess the underlying mechanisms which may contribute friction to learning and knowledge sharing, therefore, may be considered an important concern.

My recommendation for continued design-led research relating to presence design is to analyze the spatial support (and communicative power) of similarly critical activities in specific collaborative practices, and to observe the changes that are currently implemented in relation to how the same practices have evolved throughout history. Fruitful spatial practices to observe besides universities – that similarly rely on knowledge-sharing and dialogic interaction of different professional skills – may be legal practices (reflected through the current development of mediated courtrooms); and medical practices (reflected through the current implementation of remote presence technologies to e.g. remote operating chambers). It is from the close scrutiny of how spatial design may manifest and preserve certain human behaviour, and of the underlying assumptions and expectations from a new spatial order, that new fruitful practices may evolve as part of university procedures. To merely perceive video as a vehicle, a transparent technical tool thus appears less fruitful than to perceive video as a building material and architectural element, not least since the latter calls for a design process, which by convention makes the intentions and expectations of change explicit.

A tri-partite approach

My original mission in writing about mediated spaces was threefold. Firstly, my aim was to seek out the architects who contributed the original Xerox PARC *Media Space* prototypes, as well as others who worked on the design of mediated spaces, rooted in the early developments of second-order cybernetic thinking and ubiquitous computing. I wanted to understand the specific contribution from these architects in order to compare their descriptions, designs and reflections to my own. I further wanted to understand why the imprint on architecture from the fields of presence, media, and communications has since been so patchy, and why so few people today consider presence design or mediated spaces to be an architectural concern. Moreover, I sought to understand the links between the fields of media space research, presence research and interaction design; and how these relate to similar approaches within architectural research. I asked why – considering that most of the technology was already available twenty or thirty years ago – so few of the early insights to date have been applied, for example, to workplace design?

Secondly, in writing about my experiences and comparing them to others, I wanted to address presence design and mediated spaces as architecture. The reasons have already been presented and are founded on my personal belief that this is an architectural concern and the fact that, to date, few scholars have accepted this view.

In my approach to mediated spaces as architecture, I approached related visual practices to select useful aesthetic concepts, an attempt which also informed the third underlying part of my mission. Inherent to any design practice is a critical discourse and my attempt at writing about mediated spaces as architecture is closely linked to an ambition to simultaneously address the extension of architectural practice and to outline presence design as a new aesthetic practice with its own emerging conceptual toolbox.

My initial assumption that a technological bias in presence research could be explained by the limited contribution of architects was soon brought to pieces. My study showed that a number of architects were seminal to developments in both second-order cybernetics and media space research in the 1960s and onwards. I directed my attention to the early involvement of architects in media space research. I expected to find useful design concepts that I could apply to discuss my recent attempts in presence design. I found that although the architects initially used their experience from previous design practice (as noted, the first initial media spaces were modelled on the typical open plan layout of an architects' studio), they became increasingly interested in the actual tools that could (and would) facilitate collaboration and design. In effect, the many advances within CAD/CAM and interaction design can be related to this development, which was less focused on the spatial dimensions of mediated interaction than one may have expected from architects.

The future of the discipline

My thesis has presented different approaches to the subject, all with the aim to treat mediated spaces as architecture. What I believe this study has specifically revealed is that implicit to the proposed future extension of the discipline is an articulation of practice, which I have begun, but which requires further design-led exploration of similar kind. To explain this further, I mean that it is from the actual exposure to new collaborative settings that a reflective practice and a shared discourse between architects and media technology engineers may develop. In similar ways, that has been the case in conventional building design processes: the collaboration between different professional skills triggers conceptual development and, if continued over many years and supported by practice-based research, the emergence of a theoretical discourse will follow. Many architects and engineers would disagree with the above, due to the conflicting values that often cause conflicts in a design process. Dialogic interaction and collaboration in building design processes are advanced and effective in comparison to other interdisciplinary professional contexts.

Such a practice relies as much on the technical prerequisites from architecture as from media technology. What I have drafted, visualized, and articulated are some of the concepts relevant to a practice which I have shared with other professionals and researchers over a number of years. Were we aiming to refine our collaboration further, we would benefit from developing the tools and methods for such a design process. I have, so far, pointed at a few concepts. Continued design-led research could lead to the development of practical guidelines and methodologies to facilitate and improve the programming and design of mediated spaces. As part of this, the assimilation of presence design to existing building design procedures could be more clearly defined.

Let me illustrate the above by returning to the mediated amphitheatre of the *Point 25* musical performance, as an example of the new kind of mediated design artefacts that derive from interdisciplinary collaborations. No traditional musician would have the skill to achieve such a performance space alone; and a traditional architect neither would, nor could, design the venue alone. The result, a mediated amphitheatre, was sufficiently convincing for us to reconsider the concept of architecture and the artistic performance as aesthetic objects, traditionally defined in time and space. In order to evaluate this experiment as a cultural

artefact (the designers of which were neither conventional architects nor performers) we would need to engage in several different aesthetic discourses: music, performance arts, architecture, media, etc. Hybrid performance venues are here to stay, and new work and learning models will be implemented within work-life contexts. From this it follows that architects, designers, and media technology engineers must reconsider their work practices.

Resistance to change

The issue of resistance is problematic, I suggested, for several reasons. One is that without renewal to the profession, architecture as a cultural expression of our time will fall behind other visual practices. The extreme development is, perhaps, that architecture becomes a visual culture of its own, distinctly separated from others.

Another reason is that spaces which do not effectively support contemporary practices are of little use. With a background in workplace design, I chose to focus on how the concept of work (and of collaborative work in particular) dramatically changed in a very short space of time. Today the work of most office employees is characterised by mobility and frequent work encounters, each person being often engaged in several parallel collaborations. I showed that such a distinct development has not significantly resulted in new workplace design. I pointed at the crucial, yet intricate, relationships between space, organization and knowledge sharing in collaborative work practices.

As one of our most permanent expressions of culture, architecture and its theoretical discourse is slow to respond to social changes – a paradox, as architects supposedly service and act in response to clients' ever-changing needs. With favoured materials such as stone, metal and glass, contemporary architects, as well as their clients, still aim for eternity, leaving behind clearly defined aesthetic artefacts in time and space. The paradigm shift I have addressed nevertheless 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. The potential impact on modern society and culture from a change in existing language games can be compared to the revolutionary impact of the printing press in the fourteenth century, or of photography in the nineteenth century. It must be asked how long architectural discourse will resist this call for change.

I observed the transition that has occurred in related aesthetic practices, both in terms of changes in artistic expression and in terms of a new spectatorship. Asking how such transitions relate to the field of architecture, I propose that a new form of spectatorship may develop in architecture, should performative design strategies and mediated spaces be incorporated.

Whilst observing that architecture remains apart from many advances in media and communication technology of the last decades, I also note that presence technologies have failed, at least as expected by their suppliers. In recent years their call has joined forces with all those striving for sustainable development. Many today express a hope that the current concern and debate regarding climate change will finally prove that so-called presence technologies work. It has intrigued many of those involved that the products have not been implemented and that the expected change in behaviour has not occurred.

One part of the problem may be that products are marketed and perceived as technical devices rather than integrated into a specific context of use. As technical devices, they rarely form part of the spatial design of buildings where people, for example, meet as part of work activities. Changed meeting practices need to be addressed in relation to the existing spatial support in the office. In consequence, such products are not incorporated into the professional discourse of architects and designers, who may leave such spaces empty and unresolved on the drawings, perhaps labelled 'AV-room', 'multimedia-space', or the like. The spatial responsibilities are thus passed on to other professionals who may or may not be invited to contribute as part of a design process. The contribution from audiovisual consultants is often limited to a specific technical specification of certain allocated spaces, and if there is a brief, it remains unaddressed and vague. On other occasions, the interior of

such spaces may be seen as the responsibility of in-house technical staff, of the purchaser of equipment, or a janitor, thus detaching this space from the context of use without relation to a design process or refurbishment at hand. Facing these challenges when equipping a space for remote presence, a purchaser can rarely initiate a new design process to establish the need for presence design. Instead the purchaser ends up with a commercial equivalent, an off-the-shelf product which is not integrated with other activities. The result is an odd space, frequently one which requires unique monitoring as coordinated by purchaser and supplier, and which has little to do with work practices and the work environment as a whole.

It has been unfortunate that the concerns of presence technologies rarely meet the concerns of architectural design. If and when they do, they often fail because of a conceptual gap and because presence is not addressed in a way that reaches architects (and vice versa). Presence technologies are rarely included in architectural discourse and, conversely, architecture and spatial design are rarely included in presence discourse.

The full impact of media communication technology on society and work life in particular is yet to be seen, as new models of work are yet to be implemented. But learning environments, such as universities, are in fact preparing for a new order of learning, and adapting to equip all future students with an interdisciplinary, collaborative concept of work. A specific challenge lies in preparing architecture students for the new context of design, and the new professional identity for the architect that emerges, challenging (or extending) conventional disciplinary boundaries. The discipline of architecture accordingly becomes closely aligned to fields such as media technology and communication studies. Since conceptual and physical tools may always be improved upon – the basis of design theory – further research aiming to establish this research area and to further examine its tools will benefit architects, designers and others involved in the design of spaces where learning is a central, explicit concern, as well as researchers examining architecture's increasing assimilation of information technology and related new media. These reflections have arisen from my experiences as an architect/designer participating in a number of interdisciplinary research projects concerning new learning models and media technology. Accordingly, my aim has been to foreground the designer's perspective while developing critical perspectives on the application of design theory within specific examples, thereby emphasizing the project's allegiance to design-led research methods.

A new agenda emerges

This thesis has examined the role of presence research within architectural discipline at a time of rapid international development. It is perhaps a matter of time before architects and media technology engineers collaborate more extensively. As noted, the avant-garde architectural practice Asymptote was commissioned by the Guggenheim Museum to design an extension for their museum activities in cyberspace some years ago. The Guggenheim Virtual Museum would provide access to the services, archives, and collections of all the Guggenheim Museums via a compelling spatial environment for the virtual visitors. The virtual museum would presumably be used for events and activities specifically created for simultaneous participation, as well as viewing, for a globally distributed audience. As such one may refer to it as a mediated extension of the existing Guggenheim. Emerging from a fusion of information, space, art, commerce, and architecture, the designers and their client expected the new museum "to become the first important virtual building of the twenty-first century" (Asymptote Architects 2001).[213]

To date, our architectural canon consists of executed buildings such as those by Frank Lloyd Wright, alongside never-executed designs such as, for example, the seminal 1921 glass skyscraper in Berlin by Mies van der Rohe. Although never executed in real space, a virtual museum such as represented by Asymptote's designs may equally well impact on architectural discourse. Is there a need to distinguish, then, between new cases that are never

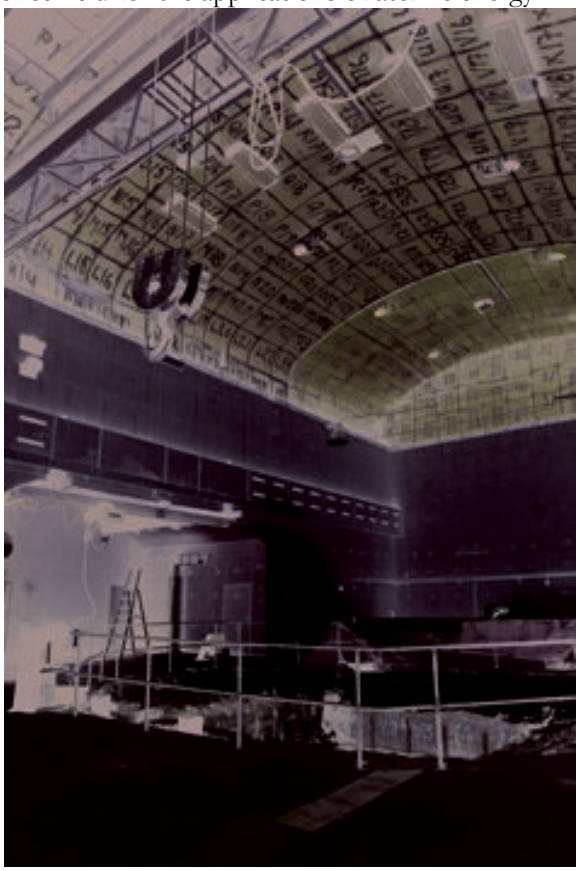
[213] The current status of the project is unclear.

intended to be realised as physical matter, and canonical cases, like the Mies skyscraper, which have only existed as a promise – a coming-into-being? One cannot prove that Mies himself aimed for his project to be executed, yet the role his design has played in the repertoire of architectural discourse, and the regularity by which this project has been referred to as actualized architecture, indicates that subsequent generations have perceived his glass aesthetics as entirely feasible. However, architects such as Mies (or da Vinci before him) conceived of virtual space quite differently than we do today, as the concepts of cyberspace or mediated space had not evolved in architectural theory to the extent they have today. Referring to this as a paradigm shift in Kuhnian terms, I have used an analogy to suggest that practitioners in my field are standing on a threshold, clinging to long-established architectural values, tools and traditions, while an unfamiliar, hybrid space is taking shape before us. In order to assimilate these new spaces into our discourse, in order to bring new spatial design thinking into our repertoire, we now need to develop new concepts, values and tools. I have sought to articulate a number of these as part of this thesis. Alongside Wittgenstein we can recognize a new language game, one based on a different set of rules, from which a new, transdisciplinary spatial aesthetic is emerging.

APPENDIX 1: FURTHER DESIGN EXAMPLES

A Mediated Control Room (2008)

Another variant of spatial montage, which explicitly aimed at extending one space to another, was carried out as part of a presence design course that centered on the topic of remote access to cultural heritage environments.[214] Our students removed the original artifacts from the control room of a former nuclear reactor hall, located underground the city of Stockholm, and arranged these inside a new mediated space, in a remote (over-ground i.e. read: more accessible) location on KTH campus.[215] The original control room has a large glazed window overlooking a grand interior of the reactor hall, through which the reactor was previously monitored. The reactor itself has been removed, but the hall still bears marks of its negative space: a cavity, surrounded by a railing reminiscent of a historic optimism once held for the applications of atomic energy.[216]



186. Today, a cavity implies absence the former the Swedish reactor 'R1'. It was closed in 1970 and dismantled in 1980. The numbered squares remain; they were drawn to ensure that all surfaces were free from radioactive substance. (Photo in Handberg 2009: 122. Photographer: Anna Gerdén, Tekniska Museet)

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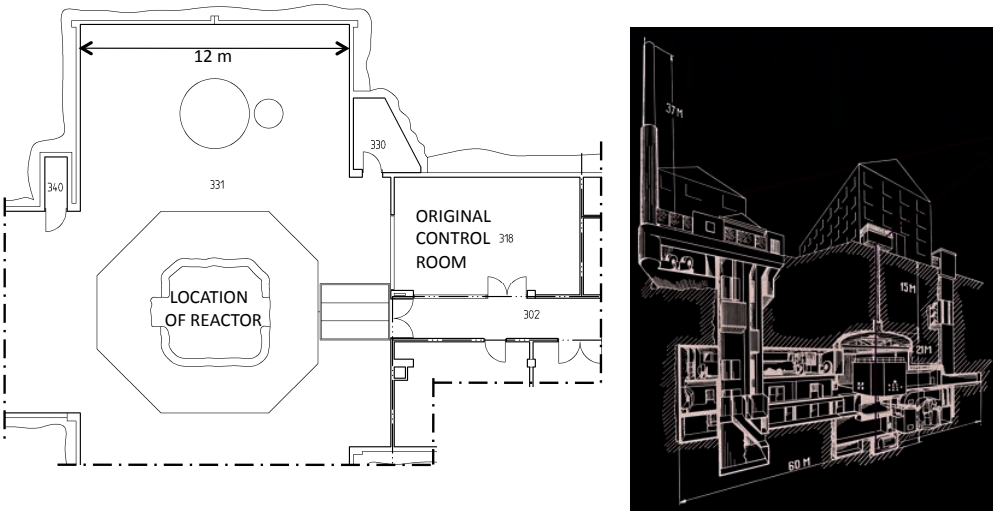
[214] See Appendix, the research project 'Remote Presence to Cultural Heritage Environments' (2006-08). My research collaboration with Leif Handberg is combined with teaching, which allows us to develop prototypes together with students, as in the course 'Presence Production in the Media Technology' at KTH.

[215] The reactor hall R1 is, in effect, located under KTH campus and currently constitutes our research laboratory for presence design, as part of a project to establish a venue for research visualization and experiments: 'KTH R1 Experimental Performance Space' to which I contribute.

[216] After World War II, the Swedish government instituted a committee to organize Swedish nuclear atomic research and develop adequate applications for pacific purposes. In retrospect, it is surprising that such a laboratory was located adjacent to the residential quarters of central Stockholm. For a historic overview (in Swedish) of the development which led to the experimental reactor hall, see Handberg (2008).

187. The original experimental reactor 'R1' on a postcard from 1954, the time when the reactor was inaugurated. The company 'AB Atomenergi' was established in 1947 to develop research and commercial applications, co-owned by the Swedish state and private corporations.

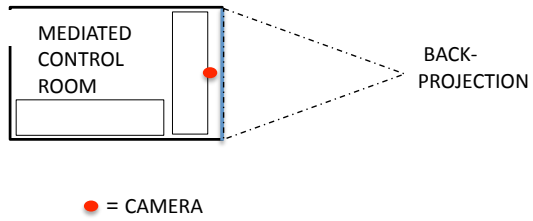
188. The same view today. Leif Handberg and Alex Jonsson are seen in the same position as the researchers above. The space is currently used as our laboratory for presence design and is established as a venue for research visualization and performance, 'KTH R1 Experimental Performance Space'. The original control room and certain artifacts can be seen through the glazed window to the right.



189. Floor plan and axonometric view of the existing reactor hall and its adjacent control room, separated by a large window. Original features and artifacts from the control room were moved to the relocated mediated control room above ground. Hollowed out from the underground rock 25 m beneath KTH campus, the reactor hall measures approximately 24x12m with a height of 12 m. (From Studsvik AB archive)

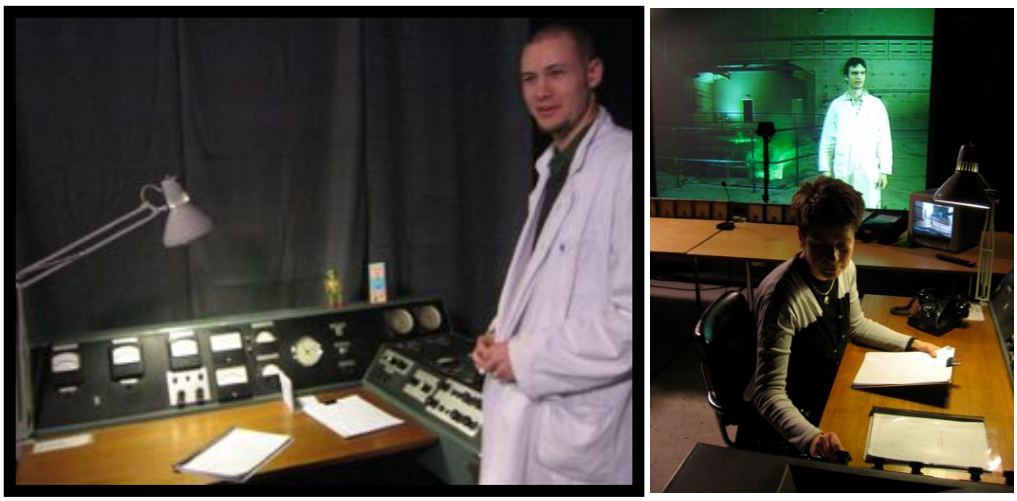
The 'new' relocated mediated control room was created with textiles and back-projection. It was similar in size to the original control room, and furnished with artefacts from the original interior. A window frame provided an 'opening' in a wall and enabled visitors to experience that they were looking out onto the reactor hall. In fact, they were looking onto a back-projected image, captured by a camera in the original setting. Visitors were invited to

both locations, and some expressed a sense of dislocation, thus illustrating the effect of spatial relocation.



190. The 'Mediated Control Room' was created by use of textiles, a simple construction, and back-projection.

191. View from inside the relocated, mediated control room. Visitors in the two locations could interact face-to-face.



192. The mediated and relocated control room was equipped with an original control panel, to which students added instruments that allowed visitors to create certain effects inside the reactor-hall, such as causing smoke (seen below).

193. Visitors were invited to both locations. Here people are seen at the original setting. The original control room is behind the window, but here it is used as a display for back-projection (by coating the glass with yoghurt), one sees what the camera in the mediated, relocated, control room captures.

What we see in this example, in contrast to those previously observed, is that certain spatial qualities of one space may be reproduced in another, and thus facilitate the understanding of a secondary spatial entity. The control room interior is furnished with original features, such as the door through which a visitor enters and instrument panels, all of which help the spectator make the association to the corresponding view seen through the large window. The window feature allows one to assume that one is looking 'through', rather than 'at' (Lanham 1993), while in reality the image is merely projected onto the surface. That a visitor can trust the situation results from a combination of factors. These include: spatial design and the inclusion of original features; that the relation between the two spaces makes sense, that life sized people are visible, that the acoustic and lighting conditions are trustworthy; that it proves possible to interact remotely with people in real time; and to monitor effects in the exterior space. Further, the framing of the window provides a clear boundary, and allows a visitor to interpret the grammar of the remote space in relation to the one in which they are standing. The *Mediated Control Room* aimed to effectively merge two spaces and the extension was designed to be natural and straightforward, and thus simple for an observer to understand and engage with. We aimed to foster a sort of spatial reciprocity, because this is when a sense of trust is best facilitated. While one space is larger than the other, it cannot be said that one space dominates the other.

In the *Atwood in Norway* example, by comparison, it was debatable as to whether Margaret Atwood experienced a similar spatial experience as the audience present in Lillehammer, but here, the relationship between the two spaces is clearly represented. As the visitor moves from one space to the other (a ten-minute walk across campus), s/he will experience a different view, but it will appear as a reciprocal spatial relationship. In turn, the *Mediated Museum* design example, where the park appeared to have entered the museum, illustrates a situation where the exterior space bore no corresponding visible features from the museum interior. This spatial imbalance was to some extent compensated by the human presence of remote guides, who attended to the curious visitor, on his/her knees, by the findings' box. The spatial imbalance nevertheless allows us to discuss the reciprocity of the mediated window or glass door. It appears as if one space was defined as primary, and another secondary – an effect which was perhaps implicit in the design brief for a 'museum extension', but which was not intended on behalf of the designers.

A Mediated Pub (2008)

194. The 'Mediated Pub', a bar and shared backdrop, displaying a typical (York) pub interior, extended from the Stockholm Resilience Conference to the Stockholm Environmental Institute in York, 2008. (Gullström, Jonsson & Handberg)

That a window is perceived differently from the exterior than the interior, as discussed above, is not unique per se. In fact, one may characterize this as a defining feature of a window. The *Mediated Museum* example is therefore more similar a real window, because in the other mediated spaces we have discussed, the deliberate intention has been to establish an opening between spaces of similar importance. Such an example, in which two spaces are treated as one, can be found in our designs for a *Mediated Pub,* which extended one conference venue to another, enabling remote mingling and socializing at a conference in Stockholm, whilst some of the guests remained in York.[217] In this example, the transparency

[217] The *Mediated Pub* user study was carried out as part of the 'Mediated Spaces' project, KTH 2008. The Stockholm Resilience International Scientific Conference, with more than 500 participants, was the launch of a new research centre, whose aim is to advance transdisciplinary research for governance of social-ecological systems. One of the contributing research groups is the Stockholm Environmental Institute, with a branch in York, United Kingdom. Several researchers in York were unable to attend the conference; so in order to make it

of the window was such that the window almost lost its role of a window, to become an opening in a wall, or a door. Unlike the grey wooden doorframes used in the *Mediated Museum*, this window had a thin black frame, which disappeared into the evening atmosphere at the bar, thus allowing conference participants to experience an extension of space. As in the previous case, the experience of a spatial extension was strengthened by human interaction. Our observations confirmed that conference delegates had many interests and views to share.

195. An unprompted and spontaneous encounter between these researchers resulted in a 40-minute conversation through the mediated window. Their interaction at the conference was fruitful enough to replace a previously scheduled trip to meet in person.

Mediated mingling between two conferences (2008)

As designers, my colleagues and I faced a similar task later in 2008, when two conferences with related themes were scheduled to take place at the same time, yet at different venues in Stockholm.[218] The two conferences attracted a similar audience and we suspected that participants in each conference would also have an interest in the conference they had not

possible for York researchers to socialise with conference participants and speakers, a mediated space for socialising and mingling was designed. The *Mediated Pub* extended the conference from Stockholm to York and supported informal conversation and mediated interaction across time and space. The following people contributed to the design and user study: Charlie Gullström, Leif Handberg, Alex Jonsson, Fredrik Hansen and Howard Cambridge.

[218] The design for *Mediated Mingling* was carried out as part of the 'Mediated Spaces' project, KTH 2008. Two different scientific conferences took place simultaneously in Stockholm in October 2008: one at the Grand Hotel and another at KTH. In order to enable social interaction between participants who would attend either conference, the conference venues were mediated. The Grand Hotel conference eChallenges was held 22-24 October. This is an annual conference in the field of information and communication technology which drew 500 participants and included 270 presentations from 35 countries. A magnificent ballroom called 'Spegelsalen' had been allocated for poster exhibitions, networking, coffee and lunch breaks. This was considered a suitable space for mediated mingling across time and space. The Nordic Creative Commons Conference at KTH 22-23 October included 45 researchers. The conference venue was Sydöstra Galleriet, a large space that allows for formal sessions as well as informal lunch and coffee breaks. The initiative to mediate the conference venues was taken by the research group and the idea was presented and approved by each organising committee. The following people contributed to the design and user study: Charlie Gullström, Leif Handberg, Alex Jonsson, Fredrik Hansen, Stefan Axelsson, Li Kolker, Kjell Eriksson.

registered for. For this reason, the schedule of the smaller conference was adjusted in such a way that its coffee breaks took place simultaneous to those at the larger conference. Although the window design was identical to the one used in the *Mediated Museum* (and similar to the *Mediated Pub*), the setting was now very different. As in the former conference design, the window was located in the coffee area, with the assumption that researchers at either location had an interest in discussing what was going on at their respective conference. Spontaneous conversations, however, appear to have been relatively few, and the window instead took the role of providing a view of a secondary space with which one had no particular relation or reason to interact, unless prompted by a specific reason (curiosity, for example).

196. The mediated window (left) and wall (right), enabling 'mediated mingling' between two conferences in Stockholm in 2008: The eChallenges conference held at the Grand Hotel and the Nordic Cultural Commons conference at KTH. Centre, Alex Jonsson entertains conference delegates at the Grand Hotel, remotely. Responsible for presence design: Gullström, Jonsson, Handberg.

In comparison to the previous design, one can say that this window was undoubtedly a window, but a closed one – a form of glazing to permit a view, but not quite an exchange of atmosphere. One distinction in relation to the previous examples was also that from the outset no effort was made to blend the two spaces, which remained separate. As a result, the remote (yet grand) atmosphere of the golden interior of the Stockholm Grand Hotel perhaps provided a sense of inferiority to the second location, at KTH, which had fewer participants and a less spectacular setting. Using this to explore how one space might dominate another, we chose to expand the window at KTH: we arranged a mediated wall next to the window, by means of back-projection, and could thus display a larger representation of the Grand

Hotel's golden foyer where the conference participants were mingling. The effect on spectators at KTH was clear: the larger space provided a better overview, and created an imbalance in the mediated interaction (see photos above).

As noted, it was our intention in this design prototype, not to engage in the mediated interaction. To a large extent, we left visitors to themselves. We did, however, remain present behind the scenes, form where we monitored different features that will have an effect on what passersby perceive. As is the case in each of the examples that I present, a presence design prototype requires a fair amount of preparation.

It is important to acknowledge the complexities of assembling, engineering, and monitoring the communications systems that enable mediated spaces. The technical expertise of an architect is in some ways similar to that of a media technology engineer, however, many of their respective areas of expertise are different. The research collaboration at the basis of this thesis can, therefore, be characterized as an extensive learning process for all parties involved. To substantiate this, I will in the following section provide some technical background on transmission issues as they relate to other design features.

Of the presence design examples to which I have referred here, some are created using 'IP-based connectivity', which means that we communicate over the Internet using standard connections via TCP (transmission control protocol) and UDP (user datagram protocol for streaming). While mediated spaces require a relatively limited transmission capacity in comparison to an uncompressed fiber communication, it must be noted that what constitutes a bottleneck for transmission is not necessarily bandwidth capacity, but rather delays in packaging and unpackaging a video signal, and the transition between analogue and digital values, most of which relate to the wide range of equipment available in presence design.[219]

In the remote conference examples, we communicated using the Internet; the *Mediated Pub* transmitted approximately 1200-1300 kbit/sec (with audio limited to 128 kbit/sec). In the example of *Mediated Mingling between two conferences*, transmission was approximately 800-1200 kbit/sec (with audio limited to 64kbit/sec).

Based on our designer observations, some of which I have already mentioned, we found that the parameters above sufficed for the experience of mediated presence. In contrast to other studies, our assessment and experience that 'it works' is not made from a focused observation of the transmission capacity isolated from other features. Rather, our reflections refer to the combined effect of spatial and technical design features – including a chosen means of transmission – that we have used repeatedly, and therefore can assess whether they work in a specific context. This concerns a combination of design features that I discuss throughout this thesis (and that provide for example, mutual gaze, the experience of architectural extension, and the creation of a spatial montage, etc.), which together support witnessed mediated presence.[220] As a designer, my aim is to facilitate the experience of mediated presence, but I cannot assert to which extent an isolated component made this possible. My aim in this thesis is to discuss different design features and conceptual tools for the presence designer, not to assert the value of each contributing feature to the larger whole. As is generally the case in architectural design, it is difficult to evaluate the individual contribution of any one specific design feature, for example, the colour scheme or the choice

[219] My colleagues often refer to the problems in assembling certain piece of equipment saying 'that one doesn't talk to this one'. The variety of combinations that exist in combining technical equipment in combination with different means of transmission makes it difficult to correctly compare different prototypes. Dedicated uncompressed fibre connections were used, for example, in the Remote Affinity project, the Mediated unemployment services, and the Mediated therapist study. It may be said that fibre transmits at the speed of light, however, the connections and selected equipment may reduce the capacity of 6 Gbit/s (uncompressed 4K video stream) or 1,5 Gbit/s (uncompressed HD). As shown by other researchers, fast transmission is not the only factor for mediated presence and the focus of the design prototypes presented here was to explore to which extent the combination of technical and spatial design could compensate for a limited transmission capacity.

[220] I write 'witnessed mediated presence' with reference to Nevejan (2007) and the establishment of trust in presence design. It is only in relation to context and the individual experience that we can discuss mediated presence.

of textile. As reflective practitioners, we can discuss why we think 'it works' using the conceptual tools provided by history and theory. It is from comparisons – between my own design experiences, others' examples, and exemplars – and through extensive discussions within a design team during and after a design process is concluded that my personal observations are based. Having collaborated closely with the same designers over many years, we have had many opportunities to compare notes and to discuss our assessments.[221]

We have, for example, found that the combination of spatial and technical design in our design prototypes compensates to some extent for limited transmission capacity. Thus the experience of mediated presence in the remote conferencing examples was comparable to other examples, where uncompressed fibre connections were used, such as in *Remote Affinity in the Archipelago*, the *Mediated Unemployment Services* and the *Mediated Museum*.

To illustrate that these assessments are grounded in reflective practice, I will use an excerpt of my notes as we were making our final adjustments on the first day of the *Mediated Mingling* project when I was in the Grand Hotel. I made my observations from a position 20m away from the mediated window, from which I had a good overview. The reason for this is that, as a team, we had decided not to interfere with the users on the first day, in order to observe how the window would be used without our involvement. On the second day, in contrast, we stood by the window and prompted conversation between participants. We found that this worked much better, in terms of increasing the number of informed interactions that took place. Our conclusion from the first day was that few participants understood that this was a real time extension of space. In spite of the information provided by the window, inviting people to interact across the window, passersby would take a glance then move on. Lanham's (1993) notion of 'looking at', rather than 'through' the window comes to mind.[222]

> [10: 30 AM]
> eChallenges/Grand Hotel has their first scheduled coffee break.
> We lose our picture –perhaps is our IP-gate not dedicated to us?[223]
> I contact Grand Hotel's technician who assures me that is the case, but he increases our connection from 3Mbit/s to 10Mbit/s just in case.
> We had arranged to synchronize the breaks but at Creative Commons/KTH they have, for some reason, not taken a break. After a while we decide to put the sound on anyway, at a low level so we don't disturb the session.
> At Grand, the room is filled with people (500) and our corner is very nicely displayed.
> Our extension to Creative Commons/KTH is at the far end and placed at 45° so it should be noticed. But it is crowded.
> Only 3-5 people walk close enough to check and to understand what is going on.
> I had placed the small bar table quite far away, thinking it would allow people to walk by and to step close. Instead people were keen to drink coffee and our table was the only one nearby. (I have as a result moved the table closer now).
>
> [11.: 30 AM]
> video out from KTH recorded at 1472 kbps
> video out from Grand recorded at 779 kbps
> 0 packet loss
>
> [12: 30 PM]

[221] This is, for example, the case with Leif Handberg, with whom I have worked since 1999 and with Alex Jonsson, with whom I collaborated since 2001. They are media technology engineers, but I make a point of referring to them as presence designers.

[222] A contribution to the eChallenges conference, our mediated extension was located alongside other exhibits in the venue, which was also used for coffee breaks and informal socializing. This meant that conference delegates would circle the room on several occasions over subsequent days, and take a closer look at whatever caught their interest. This suggests that the context of use also affected the way the mediated window was perceived. We had aimed to facilitate informal socializing between delegates at the two conferences, by synchronizing the coffee breaks, but had not fully considered the effect that 500 delegates would have in the venue, whose presence obscured the window.

[223] We had been ensured a dedicated connection to the Grand Hotel Switch. Bandwidth on the public Internet can, however, not be reserved.

eChallenges/Grand Hotel has a second scheduled coffee break
video out from KTH recorded at 1468 kbps
video out from Grand recorded at 1084 kbps
Leif and Charlie at Grand
Fredrik and Stefan at KTH
Fredrik at KTH turns sound on again [so that the sounds from Grand will attract conference delegates at KTH].
At Grand we have no outgoing sound, but we haven't changed anything.
We try to get KTH to place similar table [as above]– the effort is interrupted by sound problems.
Leif is working to sort sound.

[12: 50 PM] It is solved: the microphone cable had come loose.

[1: 30 PM]
video out from KTH recorded at 867-893-580 kbps
video out from Grand recorded at 606-993-1220 kbps
There is now a table also at KTH but no one approaches, they are busy in a work session
Two people approach as I am standing close. I tell them I am at Grand. They say 'Fancy!' and look for a while, then walk off without saying anything.
Fredrik and I stand on either side of the window and try to talk about the microphone and sound problems, but the sound is too poor.
Leif says that at The Mediated Pub we used better codecs, that we had rented: 'These codecs have no VGA-ports, so we are not running full HD from our cameras at the moment. I doubt the cameras reach their full capacity'.
We start a chat conversation.

[2: 15 PM] Fredrik: I think that was OK
[2: 15 PM] Fredrik: sound is fine, but the image...
[2: 16 PM] Fredrik: it is lousy, but at least not interrupted like before
[2: 16 PM] Fredrik: this is better than the extension between the Museum of Science and Technology and Reactor Hall [installation in 2007]
[2: 16 PM] Fredrik: but not as good as it should be
[2: 17 PM] leifh: it is ok if you stand in exactly the right position
[2: 17 PM] leifh: both in terms of sound and audio
[2: 17 PM] Fredrik: sort of
[2: 18 PM] charlieg: I think this is much worse than between York and Stockholm [the Mediated Pub] when our transmission was approximately the same kbps
[2: 18 PM] Fredrik: yes that's right
[2: 18 PM] Fredrik: but
[2: 18 PM] charlieg: Leif says the difference is the codecs we are using here
[2: 19 PM] Fredrik: yes
[2: 19 PM] Fredrik: they are worse

[2: 45 PM]
video out from KTH recorded at 530 kbps
video out from Grand recorded at 580 kbps
8 packet loss during the whole day (224)

[3: 00 PM]
Grand has a third coffee break which coincides with break at KTH
3 people approach the KTH window, and wave to seek contact.
A woman here [Grand] approached and waved but walked away
1 person at KTH is standing fairly close
Our room [at Grand] is filling but not as fast as at lunch.
I talk to Fredrik to test what we feel regarding latency. We think it is OK but discuss how to improve the image.
Before tomorrow we decide to hang a textile in order to avoid the strong light that comes through a door at KTH.[225]

[224] Because one package is very small, 8 packages really means 0 package loss.
[225] Taken from my project diary, which included a skype-chat excerpt, dated 081024. The text has been slightly edited and translated.

Our dialogue illustrates the on-going conversation between designers who collaborate in practice. Typically, this means that we repeatedly check certain features, using brief expressions informed by glances from which each of us can assert whether we are 'OK' or 'on track' or if anything must be monitored. As previously noted, presence design requires advanced technical expertise from many different specialized areas, not least because of the many choices that need to be made regarding technical equipment. Typically four to six different people are involved in the final adjustment of a prototype, distributed across the locations. In our case, many of those involved were media technology engineers, or students, all representing different skill sets and often with several years experience of (as well as a particular focus or interest in) of working with a specific technical feature. With my own experience being in architecture, I refer to us as a group of presence designers, namely to stress the many related features that must be closely monitored in presence design.

As noted in the above excerpt, we experienced some technical difficulties and used a skype-chat whilst resolving the problem. Some of the team then worked from a hidden position behind the window on the respective site. What is noteworthy here, in terms of the team discussion regarding the codec (which we declared inferior to the one used in the *Mediated Pub*), is our more recent choice to use a software-based codec.[226]

A Mediated Music Masterclass (2009)

Ernst Gombrich's concept of 'the beholder's share' is as applicable to mediated spaces as it is to decoding missing information in visual images. I will proceed to analyze two examples where 'ellipses in narration', missing details, and representational 'shortcuts' require the spectator to actively fill in a certain amount of missing information. We may discuss these as non-deliberate consequences of design or as deliberate strategies to give the beholder increasingly more to do (and to intellectually decipher), which is how Gombrich characterizes the paradigm of modern visual arts, through which we are drawn "into the magic circle of creation and (…) experience something of the thrill of 'making' which had once been the privilege of the artist" (1960: 202).

A design prototype for a *Mediated Masterclass* was tested in Stockholm in 2009, which was based on an earlier study (Enlund & Askenfeldt 2007).[227] I was not involved in this prototyping example myself.[228] Masterclass teaching can be considered an exclusive pedagogic model, in that it relies on the presence of a highly skilled professional and therefore frequently requires that students be physically present for the form of interaction a teaching session entails. To test the potential of mediated teaching, therefore, a number of studies have been carried out. In the following, we shall observe the spatial context used in one such occasion: a room in which a female singer in profile is standing centre stage, next to an accompanying piano (see photo below). A display to the left provides a face view of the singer. Similarly, a face view of the teacher is shown on the display on the right hand side. Although we have no way of knowing that this is the same face view of the teacher that the singer sees, we may assume it is. The singer is not looking at us; her gaze is directed in a direction perpendicular to our view, hidden by a black panel that allows the singer and teacher to achieve mutual gaze. As spectators, we cannot know what the teacher sees, but we assume he perceives the singer in the way she is captured on the left display.

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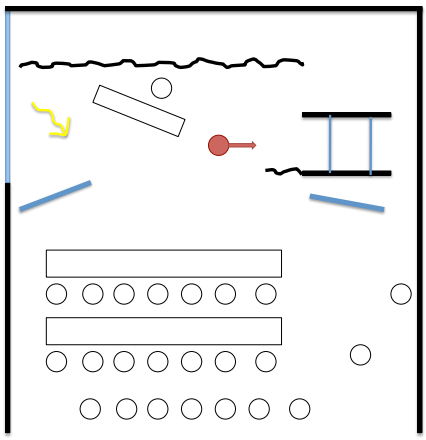
[226] For example, DVTS (Digital Video Transport System).

[227] The prototype was carried out as part of a collaboration 2007-09, labelled 'iCoach', between KTH and the Sibelius Academy, Helsinki, Finland. For more information, please contact Professor Nils Enlund, Department of Media Technology and Graphic Arts, Professor Sten Ternström and prefect Anders Askenfelt, Department of Speech, Music and Hearing; and Professors Petteri Salomaa and Keijo Lahtinen at the Sibelius Academy.

[228] My observations are based on personal communication with Nils Enlund and Leif Handberg, KTH 2009.

197. Photo from the 'Mediated Masterclass' carried out at the Royal Institute of Technology in May 2009, with a remote teacher in Helsinki.



Plan

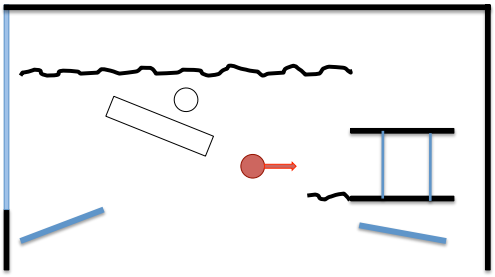
198. Schematic analysis of the spatial layout. The red arrow indicates the direction of the singer's gaze.

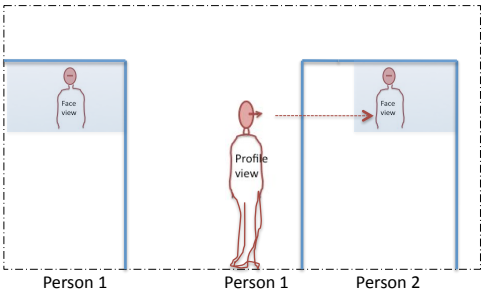
199. A close-up photo reveals the teleprompter design, behind the black wall panel, which allows the singer to achieve eye contact with the teacher.

It is curious that, as spectators, we overlook a view which is not directed towards us, but to the teacher. The way the singer stands suggests that she turns away from us, as if she were deliberately excluding us from her gaze. This is, of course, not true. The consequence, however, is the experience of spying on a private interaction, as a 'fly on the wall'. The question is why we have been invited to see beyond the boundaries of the room. If the two persons were physically sharing the room, we would either see their profile or their face view. Even if she is not hidden, the singer appears to be standing in a room separate from ours, one with clear physical boundaries (as well as less clear immaterial boundaries) suggesting that we, as spectators, are intruding on her space.

Furthermore, in observing the layout scheme in plan and elevation, we may note that the display of the teacher is placed at a height which is not aligned with the singer's gaze. This suggests that she, the singer, looks at the teacher at waist-height, rather than eye-height. Although this may not be the case, it contributes to a spatial confusion and invites us to discuss the potential of alternative spatial possibilities. The schematic spatial analysis is illustrated below.

Plan





Elevation

200. Spatial analysis in plan and elevation indicates face views and profile views. The height of the display is not aligned with the singer's eyelevel. The teacher's gaze and singer's gaze thus appear to not be aligned.

One final concern is the choice of lighting, which affects the cameras and spectators in quite different ways. The camera that captures the singer requires a well-lit room, but the strong light from the far left corner blinds the spectators.

The poor spatial correspondence between what a spectator sees and what the singer sees arguably makes it more difficult for spectators to engage in the interaction. They cannot interpret the spatial boundaries of the mediated interaction. The singer acts as a springboard to a remote space, but there are few clues as the layout of the adjacent interior. With the intention to provide a spatial extension that encompassed two people in a shared space, a more representative view of the remote location would be required. As things stand, there is no correlation between the two spaces. It can be argued that this has an affect on the dialogic interaction between the two, regardless their ability to achieve mutual gaze.

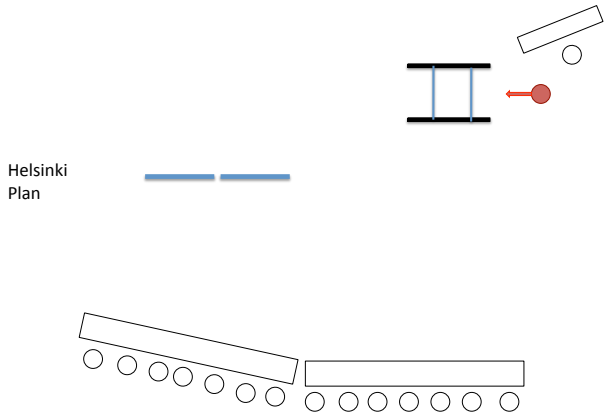
The spatial layout of the remote location (Helsinki) was similar, although certain differences can be noted. Here, the two displays, which similarly provided face views of the singer and teacher, were placed side by side. As seen below, these were at first placed to the right of the teacher, quite far away from the audience, seated to the left.

201.At first the two displays were placed to the right of the singer. (Photos of Helsinki venue by Niklas Lind)

To provide the audience with a better view, a spatial rearrangement was made, as seen below, by moving the displays closer to the audience.

202. After the rearrangement the audience faced the two displays, placed to the left of the teacher, seen here in profile.

The spectators faced the two displays that depicted a face view of the remote singer as well a face view of the teacher seated in profile to the right, by the teleprompter-based prototype. Schematically represented, the spatial layout is seen below.

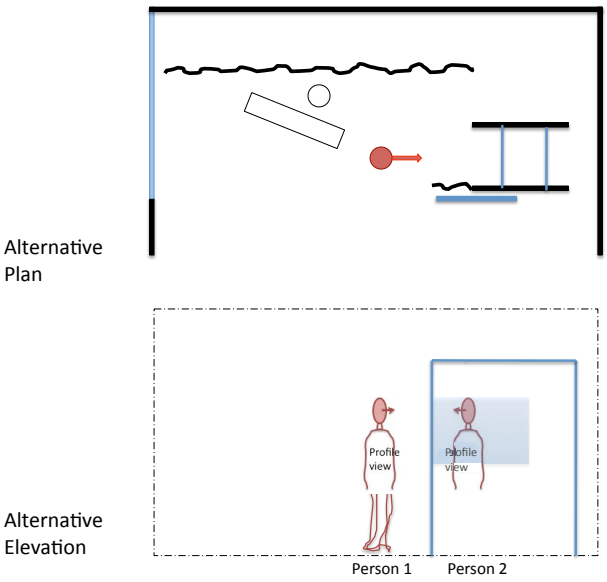


203. Schematic layout of the mediated space in Helsinki where the audience faced two displays.

204. The teleprompter-based design enabled mutual gaze and adequate visual and acoustic support for the dialogic interaction between the teacher in Helsinki, seen here, and a remote singer in Stockholm.

As in the Stockholm arrangement, the singer and teacher were seemingly present to one another. The design enabled mutual gaze and provided adequate visual and acoustic support for the experience of mediated presence. The design can thus be said to have supported (sufficiently well) the face-to-face interaction required in master-class teaching. The spatial confusion in this case was most apparent for the audience, who remained excluded from the interaction and was given the intellectual task of assembling the two spaces. According to Gombrich, the beholder's share is the act of filling in such representational and spatial shortcomings. In this sense, the above example demands an active spectatorship. It can just as easily cause a spatial confusion, in which case the attention audience may be lost. Moreover, the two audiences remained unaware of each other and that there was no intention to bring the audiences together in this shared mediated space.

Spatial confusion is common in presence design. From their work to design 'mixed objects and spaces' carried out with students in the *Atelier-project*, a design driven research group reflects that a "variety of methods can provoke confusion in participants who are unable to find a rationale to deal with the new qualities of the space where they act, as well as in the designers, who miss the compositional grammar for creating their devices and arrangements" (Binder et al. 2004: 321). This raises the question as to whether a mediated space should be modelled on real space, or provide a more extended view than real spaces can afford, in which case we may discuss how these may best be represented in order to avoid spatial confusion. Let us first turn to the first proposal, to model the mediated masterclass on the spatial relationship of real spaces. An alternative proposal would be to project a profile view of the teacher on the wall that currently hides the teleprompter design, as suggested schematically below.



205. A proposed alternative, which would provide a profile view of the teacher.

If additional views are provided, one possibility could be to consider the use of mirrors, or displays which are placed like mirrors, in correspondence to other views, a proven strategy within architecture. The house of architect Sir John Soane was designed using mirrors to the create effect of, as expressed by one critic, "a diverse array of spaces and levels, lit by clerestories and top lights, articulated by layered wall planes and reflected by both flat and convex mirrors" (Moffett et al. 2003: 423).

206. Architect Sir John Soane died after a long and distinguished career, in 1837, leaving behind the house at 13 Lincoln's Inn Fields in London, which was designed by Soane, and was where he raised his family. This house is currently a museum. (Moffett et al. 2003: 423)

Among the many halls of mirrors in the history of architecture, the remarkable interior composition of Gustav III's Pavilion, by Haga Palace in Stockholm, provides an excellent example (see below). Here, the interplay of mirrors, crystal glass and gold ornamentation extends the interior to the adjacent exterior, whilst forming a 'tertium quid' – a distinctly defined, yet extended spatial entity. While John Soane's fracturing of light and space

contributes to a spectacular and complex spatial organisation, which is intentional, the palace example produces an architectural composition of clarity and order. It is the combination of material and immaterial design features, which provides an apt comparison to contemporary examples of mediated spaces. As is the case, for example, in the extended mediated wall of the *Mediated Control Rool*, the mirrored wall which extends the salon interior will lose its capacity by the switch of light. Two hundred years may have passed since Gustav III's Pavilion was built, but the designers' tools remain almost the same. Whereas in one case, the mediated spaces rely on the source of sunlight, the other depends on fibre-optic transmission.

207. The salon at Gustav III's Pavilion by Haga Palace in Stockholm. Interior design by architect Louis Masreliez, from the end of the eighteenth century. An explicit design intention was to provide several openings to the interior, thus enabling guests to walk between the indoors and outdoors. It is noteworthy that at the time the palace was designed, the water level was almost one meter higher, further heightening the effect of the mirrors. (Bedoire 2006)

To discuss alternative ways of representing the spatial view of a remote location, we may turn to a few examples of mediated spaces used for the final defence of academic dissertations. This is followed by an example of a mediated performance venue. I was not involved in the design of any of these three examples.

Two Mediated Dissertation Defences (2009)

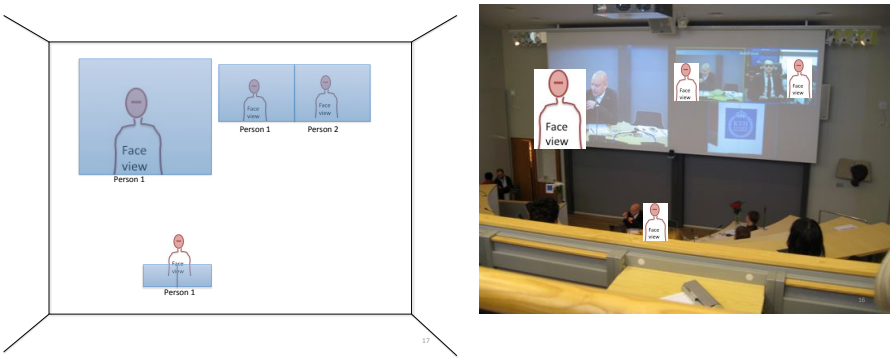
The academic model for the dialogic interaction between respondent, opponent and a scientific committee during the doctoral dissertation defence varies across cultures. It conventionally centres on the dialogue between a respondent and opponent, who share a table. In response to a question from the scientific committee or the audience, the respondent or opponent will turn to face the audience, while their primary engagement is with one another, in a face-to-face dialogue regarding the scientific work in question. In Sweden, it is customary that the scientific committee occupies the first row of the auditorium, the remainder of which is open to the general public.

I will first discuss an example which in some ways combines the *Atwood in Norway* example with the *Masterclass* prototype. The example is based on my observations of a mediated dissertation defence of an intermediate doctoral degree ('licentiate' degree') at the Royal Institute of Technology in Stockholm.[229] The photos below provide a schematic spatial analysis. Here, the respondent (architect Jonas Runberger) is alone on stage, and the remote opponent (Professor Michael Speaks, Kentucky, US), is displayed on the back wall. As illustrated by the photos, the respondent does not turn to look at the opponent, but rather faces him, via two smaller displays, which the audience cannot see. This means that both the respondent and opponent are facing the audience, suggesting – spatially – that they are addressing the spectators, rather than one another.

[229] I attended the dissertation and my personal observations also benefitted from personal communication with Jonas Runberger and Michael Speaks after the event.

208. Photo from a mediated licentiate dissertation at the Royal Institute of Technology in Stockholm 2008, where architect Jonas Runberger was awarded the Swedish academic degree of 'Teknologie Licentiate'. Runberger is both present on stage and on the display to the left, while the remote opponent Michael Speaks is visible on the right display.

A conventional videoconferencing system has been used in this example, preset to display the person who speaks. As seen below, the room thus offers three parallel face views of the respondent.



209. Schematic analysis of the relationship of the multiple face views as they appear in the performance venue.

The multiple spatial views thus provided by the system make it difficult for the spectators to interpret the stage as extended to Kentucky, but there is no doubt that the presence of the opponent manifests itself during the event. One consequence of the large projections on the wall is that the audience is encouraged to look at the displayed respondent, rather than at his original self, which is rather small by comparison.

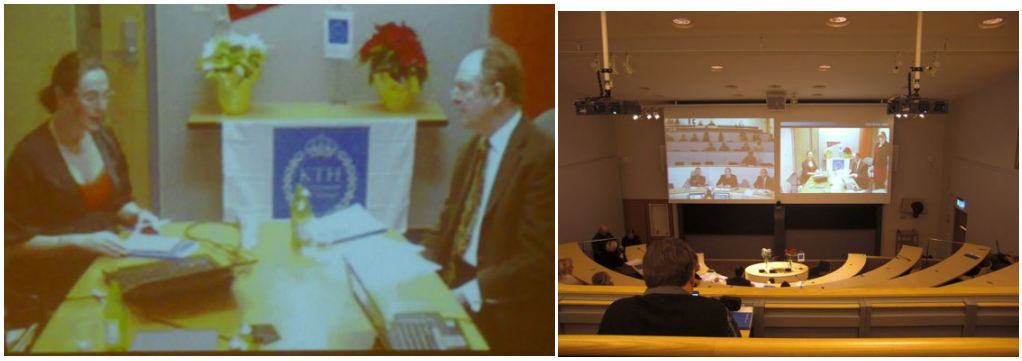
When the scientific committee and audience later address the respondent, the auditorium, in turn, is represented on the back wall, as seen below.

210.Photos taken while a member of the scientific committee addresses the respondent.

Rather than extending the auditorium to Kentucky, the result is a self-reflexive view, which suddenly makes the audience self-aware of its own, mirrored presence, and throws the spectator – at Friedberg's earlier suggestion – into the abyss. A spectator who momentarily was engaged in dialogue with the respondent (as represented on the wall) suddenly faces herself as she speaks – while the respondent has disappeared, reduced from his larger projection to his smaller, real self. The example once again addresses the role of the spectator in mediated interaction. By allowing the audience to face both respondent and opponent, the mediated space appears to involve the spectator in the dialogue. However, the moment a spectator engages in conversation, she sees herself, while the party she addressed is momentarily gone.

The same venue was used a year later for a mediated doctoral dissertation in machine design. On this occasion, both the respondent and opponent participated remotely from the Massachusetts Institute of Technology (MIT), Boston, US, while the scientific committee remained in Stockholm (with the exception of one member, who was at another location in the US and participated via telephone).[230] As seen in the following pictures, the stage in Stockholm was empty, symbolically decorated with flowers, while the small room used by the respondent and opponent was visible on one of the large displays. As on the previous occasion, the respondent was awarded her degree. It was, however, noticeable that the design affected the interaction in several ways. The dialogic interaction between respondent and opponent became more informal, and to an extent, more private, than what would have been expected in a large lecture hall facing an audience. While this may be considered beneficial to the event, it is important to discuss why and in which direction university procedures should change, and to do so prior to an event. In his sixty minute address to the respondent, the opponent did not once acknowledge the audience in such a way that one would have expected him to if he had shared the space with the audience, or experienced that he shared a mediated space. In effect, the performance linked two locations, but they remained separate. The consequence was that, although the university in Stockholm hosted the dissertation, its audience remained remote and secondary, looking onto an activity elsewhere.

[230] I attended the dissertation and my personal observations also benefitted from personal communication with the remote supervisor Margareta Norell Bergendahl after the event.



211. A mediated dissertation defence (December 2009) in Stockholm, where the respondent Diana Malvius, KTH, refraining from travel due to pregnancy, remained at MIT, where she studies. Across the table we see the opponent, from the UK. At their side, however, outside the shared mediated space, a few more participants were seated, including the academic supervisor and technical staff from KTH and MIT.

The Point 25 Mediated Performance Venue (2004)

One final example which highlights the relationship between architectural design and presence design, is the *Point 25* extended performance venue, for which two hexagon-shaped spaces were designed in 2004 by a group of researchers (Handberg et al. 2007).[231] The mediated performance space, extended between Stanford University, USA, and the Royal Institute of Technology in Stockholm, enabled professional musicians in two different locations and time zones to perform music together. As seen in the schematic spatial analysis below, the remote musicians were displayed next to those live on stage.

212. Photo and schematic analysis of the 'Point 25' mediated performance venue. Performances were carried out in real time at the Royal Institute of Technology in Stockholm and at Stanford University, USA in 2004.

[231] The project team consisted of Kristine Samuelson, Leif Handberg, Bob Smith, Claus Aase Schibsted Knudsen, Alex Jonsson, Emil Jancovic, and Erik Runeland. I attended one performance and my personal observations benefitted from personal communication with the designers after the event.

213. The 'Point 25' mediated venue at the Royal Institute of Technology in Sweden (above) and at Stanford University, USA (below).

The benefit of the design was noticed from the perspective of the audience, who experienced sitting in a 'mediated amphitheatre' where it was possible to wave and greet remote participants, as seen below. In comparison to the *Mediated Masterclass* example, this design deliberately sought to bring the two audiences into a shared mediated space.

214. Professional musicians in both locations performed music together inside a hybrid venue shared by a Swedish and American audience, in a mediated amphitheatre. The conductor was represented in form of an electronic animation of a jellyfish, which served to incorporate the transmission delay of approximately 0.25 msec.

APPENDIX 2: LIST OF PROJECTS THAT INFORMED MY RESEARCH

Design-led research from interdisciplinary research collaborations

"Modern Cultural Heritage Processes and Remote Presence" (Moderna Kulturarvsprocesser och Medierad Tillgänglighet)

My role: researcher 2009-11 and responsible for presence design (with Leif Handberg)

Three-year research project addressing modern cultural heritage processes and remote presence funded by the Swedish National Heritage Board (Riksantikvarieämbetet). The project explores how public participation and remote presence may affect cultural heritage processes over time. Case studies include mediated museum extensions to Birka and Djurgården, where a public archaeological excavation was carried out in 2008 to investigate the remains and traces of the 1897 Stockholm Art and Industry fair. Interdisciplinary research collaboration between researchers at KTH Dept. Architecture (Charlie Gullström), Media Technology (Leif Handberg) and archaeologists at the Museum of National Antiquities, Stockholm (Fredrik Svanberg, Katty Hauptman-Wahlgren).

The 2008 pilot study extending the Museum of National Antiquities to Djurgården was carried out in collaboration between KTH and the Museum of National Antiquities of Sweden, with funding also from the Swedish Arts Council and the Royal Court of Sweden. The project group consisted of (from KTH): myself, Leif Handberg, Stefan Axelsson, Fredrik Hansen and Jacob Waller; (from the Museum of National Antiquities): Katty Hauptman Wahlgren, Fredrik Svanberg, Gunnar Andersson, Jonas Nordin, Li Kolker, Susanna Johansson, Camilla Grön, Ida Johansson, Cecilia von Heijne, Christer Åhlin.

Url: <www.mediatedmuseum.se>

"The VINNOVA Centre of Excellence for Sustainable Communications"

My role: co-applicant (2005), research leader/centre director (060411-080131)

An interdisciplinary research group headed by Charlie Gullström was awarded funding over a ten-year period by VINNOVA (Swedish Governmental Agency for Innovation Systems), KTH, and nine partners from Swedish industry and society (2-year budget 25MSEK, total budget approx. 200 MSEK). Based on a successful application in 2005 and subsequent establishment during 2006-07, the Centre develops innovative applications of media and communications to foster sustainable practices. Founding partners include Ericsson, TeliaSonera, Bonnier AB, Tidningsutgivarna (Swedish Newspapers Publishers' Association), Boverket (The National Board of Housing, Building and Planning), Joltid AB, Stiftelsen Folkets Hubb (Community Hub Foundation), Sting (Stockholm Innovation and Growth), VTI (Swedish National Road and Transport Research Institute).

Url: <www.sus.kth.se>; <http://www.kth.se/aktuellt/press/2.419/1.8409>

"Mediated Spaces"

My role: research leader 2007-09 and responsible for presence design (with Leif Handberg)

The project contributed an architectural design perspective on mediated spaces and presence design. An on-going prototyping process resulted in numerous mediated spaces, windows, and walls, i.e. hybrid design artefacts emerging from different contexts of use and design, such as the *Mediated Therapist*, the *Mediated Pub* 2008; and *Mediated Mingling* 2008. The project was funded by VINNOVA (Swedish Governmental Agency for Innovation Systems) through the Centre for Sustainable Communications, KTH, Stockholm. Partners: Ericsson, Stockholm Resilience Centre/Stockholm Environmental Institute, Videra, Agneta Ekman, private consultant. The project is reported as part of a doctoral dissertation at KTH (Gullström, forthcoming 2010).

Besides myself, the following people contributed to the design and user studies: (Mediated Mingling): Leif Handberg, Alex Jonsson, Fredrik Hansen, Stefan Axelsson, Li Kolker, Kjell Eriksson; (the

Mediated Pub): Leif Handberg, Alex Jonsson, Fredrik Hansen, Howard Cambridge; (the Mediated therapist): Leif Handberg, Arild Jägerskogh, Agneta Ekman and patients.

"R1-RAÄ: Remote presence to cultural heritage environments" (En tillgänglig forskningskulturmiljö)

My role: researcher 2006-08 and responsible for presence design (with Leif Handberg)

The project was funded by the Swedish National Heritage Board (Riksantikvarieämbetet) as a collaboration between KTH and the Museum of Science and Technology in Stockholm. It explored the contribution from media technology to enable 'remote presence' to environments that for different reasons are inaccessible, difficult to access or where access would require physical alterations that might endanger cultural heritage values. The project developed experimental design prototypes to explore remote presence as an alternative, or complement, to actual visits to cultural heritage environments. The main case study was the discontinued Reactor Hall at KTH where Sweden's first nuclear reactor was operational between 1954-1970 and still is a representative of a unique research environment. (Project Leader: Leif Handberg)

Url: <www.r1.kth.se>

"Mediated Unemployment Services in Dalarna" (Service, utveckling och kommunikation, Norra Dalarna)

My role: researcher, architect/designer 2004-06 and responsible for presence design (with Mats Erixon)

EU-funded research project which has developed and implemented mediated services for the Swedish Unemployment Services in the Dalarna region, hosted by Teknikdalen Foundation (www.teknikdalen.se). As a result of the project, staff in eight locations communicate remotely with clients in the region via a 'Remote Meeting Place' designed by Gullström Architects AB. Headed by the Unemployment Services in Mora and Malung, the mediated services in Dalarna are operational since 2005. The interdisciplinary research team also included Mary Westermark, Mats Erixon, Minna Räsänen, Emil Jankovic. The project was hosted by Teknikdalen, with funding from EU Region Dalarna, Länsarbetsnämnden, Försäkringskassan, TeliaSonera, Älvdalens Kommun, KTH, Stiftelsen Folkets Hubb

Url: <http: //www.teknikdalen.se/336.php>

Publications: www.projektbanken.z.lst.se/rapporter/Fil-200842411912.pdf, http: //www.infra.kth.se/fms/pdf/Moberg_et_al_2008.pdf

"Remote Affinity Project" (Projektet Samhörighet på Distans)

My role: researcher, architect/designer 2001-04 and responsible for presence design (with Mats Erixon)

Interdisciplinary research project to explore the possibilities of 'remote presence' and to create a shared work environment for staff in three distributed call centres located on the islands Sandhamn, Arholma and Ornö in the Stockholm archipelago. A participatory design process resulted in the designs for a Meeting Bar which enabled informal social interaction between the three workplaces. Contributing parties: Swedish Police, Statens Utvecklingsråd, Stockholms Läns Landsting, Vinnova, KTH Centre for user-oriented interaction design, Stiftelsen Folkets Hubb, Gullström Architects AB (with architect Matilda Stannow). The interdisciplinary research team also included Sören Lenman (Project Leader), Mats Erixon, Minna Räsänen, Björn Thuresson, Bo Westerlund, Anders Wiberg. Architect Matilda Stannow contributed as designer.

Url: <http://cid.nada.kth.se/k>

Publication: Gullström-Hughes, C. et al. 2003. 'Samhörighet på distans'. Report KTH CID: 248. Stockholm: KTH; Räsänen et al 2005. 'Samhörighet på distans. Slutrapport'. Technical Report CID: 325. Stockholm: KTH

"Learning Lab Space Design Project"

My role: process leader, architect 1999

This research project aimed to develop and implement new learning models and experimental learning spaces at KTH. I was responsible for participatory design and architectural programming for the Department of Media Technology and the Learning Lab. Project funded by KTH, K&A Wallenberg Foundation, Wallenberg Global Learning Networks (WGLN), Stanford University

Url: Wallenberg Global Learning Network 2010. 'WGLN 1 Projects 1999-2004', downloaded 100606 <http: //www.wgln.org/>

Publication: Gullström & Westerberg Arkitektkontor AB. 1999. 'Programhandling: KTH Learning Lab Space Design Project, Hus 43: 6', architectural programming, work drawings and project specifications dated 991119

"iSpaces Project Module 1, Integrating Technology and Physical Environment"

My role: researcher 2001-02

In collaboration between the Swedish Learning Lab and the Stanford Learning Lab, this project addressed the need to combine architectural and technical design to support different modes of learning (flexible learning space design, virtual presence production, learning in flexible spaces). The project resulted in design prototypes and was funded by K&A Wallenberg Foundation and based at the Dept of Media Technology. The interdisciplinary research team also included Leif Handberg, Per Melander, Andrew Milne, Alex Jonsson, Claus Knudsen, Mats Erixon.

Url: iSpaces 1999. 'SpaceDesign: Physical Integration of Technology' (Palo Alto, CA: Stanford University), downloaded 100713 <http://dart.stanford.edu:8080/sparrow_2.0/pages/teams/SpaceDesign/SpaceDesign.html>

Wallenberg Global Learning Network 2010. 'WGLN 1 Projects 1999-2004', downloaded 100606 <http: //www.wgln.org/>

Publication: Gullström-Hughes, C. Melander, P. Milne, A.J. 2002. 'ISpace Module 1: Interim Project Report', April 4, 2002, KTH Media Technology

"The flexible workspace. Room for work: Space for collaboration" (Flexkontor. Rum för arbete–Plats för samarbete)

My role: researcher, architect 1997-98

I was responsible for this practice-based research project which sums up the reflective practice of Gullström & Westerberg Arkitektkontor AB. Funded by Arkus (Arkitekternas forum för forskning och utveckling).

Publication: Gullström-Hughes, C., Westerberg, L. 1998. Flexkontor. Rum för arbete. Plats för samarbete. Stockholm: Byggförlaget

"A good research environment is dynamic, demanding and courageous" (Projektet En god forskningsmiljö)

My role: researcher 1993-96

This research project for the Scientific Advisory Board of the Swedish Council for Building Research aimed for key indicators to be used in the evaluation of research environments. Research was carried out together with Birgit Cold (Project Leader) and Sigmund Asmervik as collaboration between Allforsk, NTH Trondheim and KTH.

Publications: Asmervik, S. Cold, B., Gullström, C. 1996. A good research environment is dynamic, demanding and courageous, The Scientific Advisory Board of the Swedish Council for Building Research in cooperation with Allforsk, NTH Norway and KTH, Sweden 1996 (BVN 1995: 1)

Asmervik, S., Cold, B., Gullström C. 1995. En god forskningsmiljö är levande, krävande, modig och djärv, Byggforskningsrådets Vetenskapliga Nämnd 1995: 1

"The Paradox of Mastery. Professional skill and knowledge transfer in Swedish 20th century architecture" (Mästerskapets Paradox. Om yrkeskunnande och kunskapsöverföring i den svenska arkitekturen under 1900-talet)

My role: doctoral student, 1990-94

Research undertaken within my Ph.D. programme at the Royal Institute of Technology, Department of Architecture and the KTH Skill & Technology programme

Publication: Gullström, C. 1994. Mästerskapets Paradox. Om yrkeskunnande och kunskapsöverföring i den svenska arkitekturen under 1900-talet. Akademisk licentiatavhandling, KTH. Academic Dissertation for Licentiate Degree in Architecture. Stockholm: Royal Institute of Technology.

"The Architecture of Léonie Geisendorf" 1990 (Léonie Geisendorf Arkitektur)

My role: project leader

Research and exhibition design in collaboration with architect Léonie Geisendrof resulting in an exhibition at the Swedish Art Academy. Funding from the Swedish Council for Building Research, KTH, Arkus, Arkitekternas forum för forskning och utveckling, and several scholarships (Helgo Zetterwalls fond, Stockholms Byggnadsförening, Peter och Birgitta Celsings stiftelse,

Publication: Gullström, C. (ed) 1990. Léonie Geisendorf Arkitektur.

Selected executed commissions at Gullström Architects AB (2001-2007) and Gullström & Westerberg AB (1993-2001)

2007, 2005. Kemi & Miljö/Good Point Advisors for sustainable growth, Centralbadet, Stockholm. Responsible architect for office refurbishment and workplace design. 700 sqm.

2005, 1998-99. Swedbank, Stureplan, Stockholm. Responsible architect for office refurbishment and workplace design. 900 sqm.

2004. Guide Konsult, Stockholm. Responsible architect for interior design. 400 sqm.

2003-2005 i2i furniture design, prototyping by Gullström Architects and Mats Erixon, for e.g. Swedish Unemployment Services in Dalarna.

2002-03. Telia Sonera International Carrier. Responsible architect for three mediated meeting rooms in Stockholm, London & Reston US. 60 sqm.

2002. iLounge, IT-University, Kista, Responsible architect for interior design of 'iLounge medialab' for the research group DSV/FUSE 80 sqm.

2000-01. Work IKEA, Sweden. Consultant regarding workplace design.

1999-2000. Cygate Sweden, Stockholm. Responsible architect for office refurbishment and workplace design. 3000 sqm.

1998-99. ICA retail, Årsta, Stockholm. Responsible architect for office refurbishment and workplace design. 3100 sqm.

1998-99. ICA retail, Gothenburg. Responsible architect for office refurbishment and workplace design. 1500 sqm.

1998-99. Det Norske Veritas. Responsible architect for office refurbishment. 500 sqm.

1998-99, Stockholm School of Economics, Centre for Communication and Information research. Responsible architect for education facilities and café. 200 sqm.

1997-99. Lantmäteriverket, Gävle. Architect, office refurbishment and workplace design. 2500 sqm.

1998. Kemi & Miljö, Stockholm. Responsible architect for office refurbishment and workplace design. 400 sqm.

1998. Schering Nordiska, Stockholm. Responsible architect for office refurbishment and workplace design. 500 sqm.

1997-98. GCI Rinfo, Stockholm. Responsible architect for office refurbishment and workplace design. 800 sqm.

1997-98. Telia TeleCom, Haninge, Stockholm. Architect, office refurbishment and workplace design. 3500 sqm.

1996-98. Skanska Øresund, Kv Arkaden, Malmö. Architect, building refurbishment and workplace design. 15000 sqm.

1997-98. Siemens Nixdorf, Upplands Väsby, Stockholm. Architect, office refurbishment and workplace design. 4000 sqm.

1996. The Natural Step Foundation, Stockholm. Responsible architect for office refurbishment and workplace design. 600 sqm.

1996. Siemens Svensk Marknad, Solna, Stockholm. Responsible architect for office refurbishment and workplace design. 1700 sqm.

1994-95. KTH Department of Teleinformatics, Electrum, Kista. Architect, office refurbishment and design for project-based work and learning environments. 1250 sqm.

1994-95. Skanska, Årstadal. Stockholm. Architect, office refurbishment and workplace design. 400 sqm.

1993-94.Electrolux Press center and information unit. Architect, office refurbishment and workplace design. 400 sqm.

1993-95. Ericsson Radio Systems & Ericson Business Communications. Responsible architect for over 20 executed commissions regarding office refurbishment and innovative teamspace design. 20 000 sqm. (See publication 'Flexkontor' (in Swedish) Gullström, & Westerberg 1998)

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