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Social, Ethical, and Legal Issues in Presence Research and Applications

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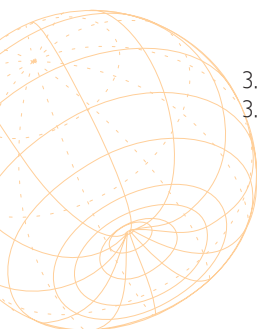
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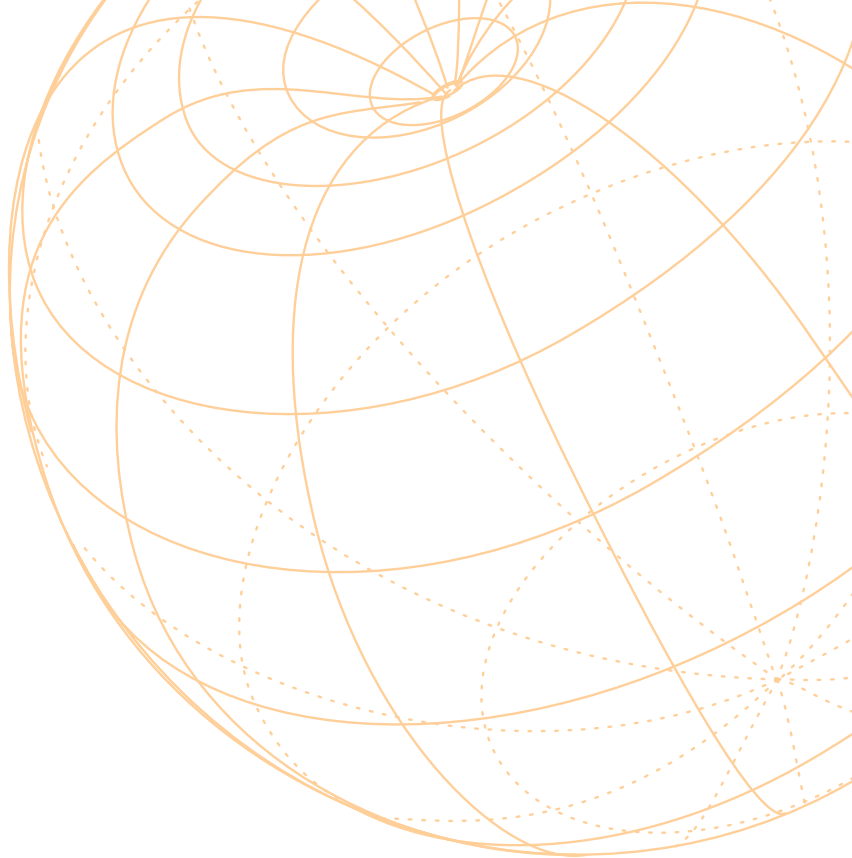
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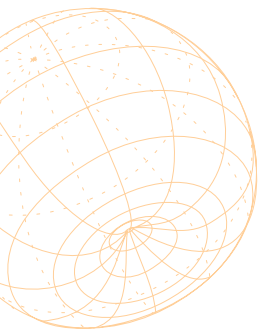




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Acronyms

3D	3-dimensional
BCI	Brain-Computer Interface
CAVE	Cave Automatic Virtual Environment
EEG	Electroencephalography
ELSA	Ethical, Legal, and Social Aspects
ETH	Eidgenössische Technische Hochschule (Swiss Federal Institute of Technology)
EU	European Union
EULA	End User License Agreement
IP	Integrated Project
NGO	Non-Governmental Organization
OII	Oxford Internet Institute
PTSD	Post Traumatic Stress Disorder
SL	Second Life
SNA	Social Network Analysis
SVE	Shared Virtual Environment
TU	Technical University
TV	Television
UK	United Kingdom
VE	Virtual Environment
VR	Virtual Reality





I Social, Ethical, and Legal Issues in Presence Research and Applications

I.1 Background, Relevance, and Goal of the Report

This report analyses the social, ethical, and legal issues of Presence technologies and their implications for society. Most generally, Presence is an emerging and interdisciplinary field of research and refers to the cognitive experience of being somewhere.¹ Presence thus aims at achieving realistic feelings and experiences of an environment that does not actually exist, using a broad range of technologies. While virtual and augmented realities, CAVEs, head-mounted displays, and high-end cinemas are among the more well-known examples, recent developments have brought about novel and potentially more intrusive technologies like brain-computer interfaces (BCI), which can translate brainwaves into control signals and vice versa. Over the past decade, research in this area has made considerable progress: in one case researchers have successfully enabled a tetraplegic to steer a virtual wheelchair through a virtual environment just with their thoughts. While Presence technologies are only slowly entering mass markets and applications in fields like medicine, military, entertainment or gaming, they are likely to play an increasingly important role in society. Powered by recent advances in disciplines like neuroscience, cognitive science, computer science and psychology, Presence technologies are therefore bound to change the world as we experience it.

Against this backdrop, Presence technologies are likely to pose a variety of social, ethical, and legal issues. Our perception of the world plays a crucial role in virtually

everything we do. As human beings we act upon our understanding of the world and make practical and moral choices – most of the time with considerable consequences for ourselves and others. The purpose of Presence technologies is exactly to mediate and – if necessary – modify this highly sensitive process. This can be a tremendous opportunity to improve lives as applications in high-precision surgery show. On the other hand, the very same technologies can have a variety of unintended consequences. Given our limited experience with the long-term implications of Presence technologies, there is a risk for fundamental human values as well as legitimate public interests. Further, Presence technologies can open up a new channel of control over people's perceptions. This leaves considerable potential for strategic manipulation by governments, corporations, or individuals.

To date, there has been very little research on the social aspects of this emergent field. As has been noted in the Peach Roadmap (Issue I), social, ethical, and legal issues have tended to be a relatively isolated and small-scale part in research on Presence.² This is partly due to disciplinary specialism, but also because Presence technologies have entered into the mass market mainly in the form of online games and virtual worlds and can otherwise mainly be found in niche applications. This means that there has been a very uneven and scattered discussion of these issues, if any. Presence technologies are often related to a number of other 'Presence-like' technologies with which they have important overlaps, but this overlap has been overlooked because Presence technologies are often related to other computer science developments such as artificial agents and simulations.

¹ See PEACH, Coordination Action, Annex I – Description of Work, March 31, 2006, p. 5.

² Giulio Ruffini (ed.), D3.1 Visions, Roadmaps, the ERA [Issue I], May 22, 2007, p. 6.

The goal of this report is therefore to take a closer look at the field in its entirety, identify the key social, ethical, and legal issues, and map the strategies that can or should be taken to accompany the development of Presence.

1.2 Definitions and Delimitations

Before we dive into the analysis, it is important to clarify a number of concepts. These concepts will not only guide, but also delimit the scope of the inquiry.

1.2.1 Presence

Defining the field of Presence remains a somewhat controversial issue. Different disciplines have different interests, perspectives, and approaches to the phenomenon and consequently emphasize different aspects. A social science perspective is first and foremost concerned with the role of human beings in the context of Presence technologies. In this report, we will therefore use a definition that has been successfully applied in the area of virtual environments (VE) or virtual environment technologies.³ Here, Presence technologies are those in which the user or users have a sense of being in a place or space other than the one they are physically in, and being able to interact with that environment. As we shall see, technology and environments for “being there together”, where the user is not experiencing the environment individually but with others, have become the most widespread use of the technology and the one that raises the most complex social, ethical, and legal issues.

This definition is compatible with existing definitions and approaches to Presence. According to Slater and

others, the goal of Presence research and applications is the “successful replacement/augmentation of sensory data with virtual generated data.” Further, the Peach Roadmap (D3.1 Issue III, ⁴ April 2009) defines Presence as “the field studying the science, technology and social aspects of increasingly more powerful, digitally mediated interaction aiming to produce ‘real’-feeling experiences while assessing the impact of these new interaction technologies at the individual and social level.” The *International Society for Presence Research* regards Presence primarily as “a psychological state or subjective perception in which even though part or all of an individual’s experience is generated by and/or filtered through human-made technology, part or all of the individual’s perception fails to accurately acknowledge the role of the technology in the experience.”⁶

While the debate about these definitions will continue,⁷ the different viewpoints more generally reflect the pervasiveness and diversity of Presence in a variety of social settings: Presence as a psychological state, a field of research and commercial applications, or mechanism for engineering human perception. Underlying all these approaches is the idea that the important social implications of this technology relate to the experience of being in another place or space and not just to the cognitive science of machine learning, artificial intelligence, or simulations and the like. Moreover, the most critical social issues relate not to single-user settings (though these will be discussed below), but rather, as just mentioned, to multi-user scenarios where people are interacting in the virtual space. That is because in the latter case, the issues relate not only to one’s person’s well-being, but to how that person’s well-being depends on others in the context of Presence technologies.

³ See Ralph Schroeder, *POSSIBLE WORLDS: THE SOCIAL DYNAMICS OF VIRTUAL REALITY TECHNOLOGY* (1996); Ralph Schroeder & Ann-Sofie Axelsson, *Avatars at Work and Play: Overlapping Themes and Intersecting Research Agendas*, in Ralph Schroeder & Ann-Sofie Axelsson (eds.), *AVATARS AT WORK AND PLAY: COLLABORATION AND INTERACTION IN SHARED VIRTUAL ENVIRONMENTS* (2006: LONDON: SPRINGER), pp. ix-xv

⁴ Giulio Ruffini (ed.), *D3.1 Visions, Roadmaps, the ERA [Issue II]*, May 15, 2008, p. 11.

⁶ International Society for Presence Research, *An Explication of Presence*, available at <http://www.ispr.info/> (section “About Presence”) (last visited March 17, 2009).

⁷ See, e.g., the discussion on the Peach WinG5 blog, <http://www.peachbit.org/> (last visited Jan. 18, 2009).

1.2.2 Social, Ethical, and Legal Issues

Another key concept in this report is that of social, ethical, and legal issues. While these have more or less specific meaning, they also overlap and depend upon each other to a certain degree.

1.2.2.1 Social Issues

Social issues generally refer to the implications of the actions of one person for other persons. The "social" here comprises the interactions among people and the dynamics that emerge from them at larger levels of aggregation. In order to identify social issues, we therefore have to understand how people behave with regard to others under different circumstances and what the consequences of these interactions are for different units of society, like individuals, organisations or networks.

A social "issue" therefore usually occurs if there is some tangible change in the configuration of social interactions and the environments they take place in. These changes bring up questions such as who benefits and who loses, how is the motivation of actors influenced, what risks and perceived problems occur, and how do people adapt their behaviour to the new situation and change their practices in response.

Especially Presence technologies have considerable potential to reconfigure interactions. As intermediaries of perception, they have an immediate impact on how people view and make sense of the world and on how they act upon that basis upon others. Every change in the technologies of perception potentially transforms the way people view their environments. Examining these complex interrelations will be key challenge with regard to the social issues of Presence technologies.

1.2.2.2 Ethical Issues

In contrast to social issues, ethical issues mostly reflect a concern with "good" and "bad" conduct. The starting point here is usually a set of moral principles that are used to evaluate behaviour and its implications.

The exact definition, interpretation, and application of these principles has been subject to debates among philosophers for thousands of years. However, it seems safe to assume that there is a minimum set of principles and values that can be regarded as commonly accepted in EU countries. Among those are values like human dignity, freedom of expression, privacy, equality and justice, but also more socially oriented ones like solidarity. Some of these values are reflected in legal documents like the Council of Europe's European Convention on Human Rights⁸ or the Charter of Fundamental Rights of the European Union⁹ as well as the law of the European communities. Others are framed in codes of conduct of non-state organizations like companies, industry association or universities. Especially the latter have been increasingly concerned with providing ethical guidelines for researchers and mandating ethical review of research projects. In addition to such institutionalized forms of ethical review and assessment, there is also a more applied dimension of ethics that focuses on the application of ethics in the everyday practices of people. Examples of such an approach are the fields of business ethics or bioethics, which are particularly relevant from a public policy perspective. Presence technologies also seem to be a field in which such considerations can be fruitfully employed.

Overall, ethical issues involve some form of normative assessment of social practices and therefore naturally build on a thorough understanding of the social issues at hand.

⁸ See Council of Europe, *Convention for the Protection of Human Rights and Fundamental Freedoms*, Rome, November 4, 1950, <http://conventions.coe.int/treaty/en/Treaties/Html/005.htm> (last visited Jan. 18, 2009).

⁹ See, e.g., European Parliament, *Charter of Fundamental Rights of the European Union*, http://www.europarl.europa.eu/charter/default_en.htm (last visited Jan. 18, 2009).

1.2.2.3 Legal Issues

Legal issues arise in the context of the normative framework as established and enforced by legal authorities and institutions. While regulations, directives, and rules address specific problems of society, the abovementioned fundamental rights and values guide the application of these norms at a higher level of abstraction. The law, in this sense, can be seen as aiming to address social issues by institutionalizing procedures for generating, enforcing, and solving conflicts over norms. Legal issues therefore can occur when new circumstances such as new technologies challenge existing interpretations of the law. This challenge may be addressed at the level of legal doctrine and the application of norms in court cases or government regulations. It can also lead to the insight that the existing legal framework does not meet the goals anymore it set out to achieve and therefore needs to be adapted to new circumstances. A connection with ethics can be seen in that legal institutions and practices usually attempt to balance conflicting values and principles and therefore inevitably require an ethical assessment.

While this report discusses legal issues where they seem relevant, it is important to point out that this is not an in-depth legal analysis of the framework regulating Presence technologies.

1.2.2.4 Need for Comprehensive Perspective

As the preceding paragraphs show, it is not always possible to clearly delineate social, ethical, and legal issues. While these are already complex concepts in themselves, they refer to and build on each other in many different ways. For example, a thorough understanding of the social issues is often the first step towards an ethical assessment and further legal analysis. Conversely, dysfunctional norms and regulations can be the cause of social issues that require ethical assessment and, in turn, may lead to a new legal framework.

The goal here is therefore not to keep these issues clearly apart and introduce distinctions that do not actually exist in practice and – in the worst case – may even distort the analysis. Rather, the key is to be aware of the different aspects of social, ethical, and legal

issues and reflect on them critically as they occur in the context of Presence technologies.

1.3 Methodology

The research in this report was carried out as part of the three-year Peach project. The data on which the analysis is based was gathered in a number of ways. For the case studies of the four Integrated Projects, a number of semi-structured interviews with researchers and industry representatives have been conducted face-to-face and by phone. There has also been much input from the Peach Roadmap and WinG4 community, extensive desk research, informal discussions with researchers, and reviews of materials from conferences and workshops.





2 Empirical Analysis of Current Issues in Presence Research and Applications

In order to gain a better understanding of the social, ethical, and legal issues of Presence technologies, the Peach team conducted a number of empirical analyses. In view of the still limited experience with Presence technologies in everyday life, we pursued two approaches. First, we conducted in-depth case studies of the four Integrated Projects (IPs) PRESENCCIA, IPCity, PASION, and IMMERSENCE (section 2.1). Second, we systematically gathered input from the Peach community on the occasion of several events (see section 2.2). These events included brainstorming and feedback sessions explicitly focused on social, ethical, and legal issues, but also open debates and discussions at other events, where the Peach team observed, solicited, and discussed the experiences and ideas of researchers and industry representatives involved with Presence technologies on a daily basis.

2.1 Case Studies of Integrated Projects

Although all four Integrated Projects contribute to the overall field of Presence research and applications, they do so from very different angles, using a wide range of methodologies and analytic frameworks and pointing to quite different potential applications. The aim of this section is therefore to scope the PRESENCCIA, IPCity, PASION, and IMMERSENCE projects and give an overview of the social, ethical, and legal issues. Each project is introduced with a short

summary of its goals and activities before the social, ethical legal issues are analyzed in greater detail. In accordance with the Roadmap, we examined these issues separately in the two main areas, i.e. research and application. While the former focuses on issues that arose while conducting Presence research, the latter attempts an outlook on the – in most cases hypothetical – mid- and long-term implications of the findings and their application in society.

The overview is mainly based on a review of publicly available project reports and deliverables as of March 2009, extensive desk research, and semi-structured interviews with key researchers and project leaders during the Peach Summer School 2008 in Dubrovnik.¹⁰

2.1.1 PRESENCCIA

PRESENCCIA stands for “Presence: Research Encompassing Sensory Enhancement, Neuroscience, Cerebral-Computer Interfaces and Applications” and is the successor of the PRESENCIA project.¹¹ It is based on an operational definition of Presence, focusing on the successful replacement and augmentation of sensory data with virtually generated data so that people act and respond as if the data were real.¹² Under the aegis of Mel Slater at the Universitat Politècnica de Catalunya, the project aims to deliver Presence in wide-area distributed mixed-reality environments. In order to do so, the team of researchers conducts mostly experiments to provide

¹⁰ See Appendix for an overview. We would like to thank the interviewees for their time and contribution of their expertise.

¹¹ PRESENCCIA Website, <http://presenccia.org/> (last visited May 11, 2008). For more information on the Presencia project see Presencia Website, <http://www.cs.ucl.ac.uk/research/vr/Projects/Presencia/> (last visited May 11, 2008).

¹² See Mel Slater, Presentation about PRESENCCIA at the PEACH summer schools, Santorini 2007 and Dubrovnik 2008.

an empirical and statistical basis for Presence, gather data on the unity of perceptual experience, and examine spatial Presence at the individual level.

2.1.1.1 Project Details

The research appears to be broadly rooted within the paradigm and methodologies of neuroscience and focuses on two distinct aspects of Presence. The first aspect revolves around the challenges and opportunities of brain-computer interfaces (BCI). BCIs are technological artefacts that analyze brain activity and transform the electroencephalographic changes into control signals. This enables researchers to establish a direct communication channel between the human brain and a machine with far-ranging implications, for instance, in the field of medicine. Examples of experiments conducted so far are the successful attempt to let people move through a virtual model of the Austrian National Library by performing motor imagery¹³ or using the brainwaves of a tetraplegic to control the movements of a wheelchair in a virtual environment.¹⁴ The second aspect concerns the field of multi-sensory Presence, i.e. the question of how different senses work and produce perceptions. Papers in this area have addressed questions like how false heartbeat feedback affects emotional response to pictures,¹⁵ lightness illusions and why we see them,¹⁶ or auditory-visual integration in virtual environments.¹⁷

2.1.1.2 Analysis

Both aspects pose a number of ethical, legal, and social issues, which can be broadly grouped into two categories.

2.1.1.2.1 Research Ethics

The first category deals with research ethics. Virtually all PRESENCCIA experiments involve human subjects and therefore raise a number of difficult ethical questions. Since at the heart of the project is the "successful replacement and augmentation of sensory data with virtually generated data," questions of deception and respect for the autonomy of the individual come inevitably on the agenda. Many experiments take place in a complex field of conflicting values and interests that need to be balanced and—if possible—reconciled. The PRESENCCIA team took on these issues right from the start and commissioned a report that specifically addresses the ethical dimension of their research.¹⁸

One of the key issues in the PRESENCCIA project is the use of immersive virtual environments to conduct experiments with human subjects that would not be ethically admissible in real life. It has been claimed that such environments can provide a "research tool for social and psychological scientists and also for policy makers, in order to investigate problems under laboratory style conditions that would otherwise not be possible due to practical or ethical

¹³ Robert Leeb et al., *Self-paced exploration of the Austrian National Library through thought*, *International Journal of Bioelectromagnetism*, 2007, Vol. 9, No. 4, 237-244.

¹⁴ Robert Leeb et al., *Self-paced (asynchronous) BCI control of a wheelchair in Virtual Environments: A case study with a tetraplegic*, *Computational Intelligence and Neuroscience special issue: "Brain-Computer Interfaces: Towards Practical Implementations and Potential Applications"*, pp. 1-8, 2007.

¹⁵ Ana Tajadura, Aleksander Väljamäe & Daniel Västfjäll, *Affecting emotional experience with auditory-vibrotactile heartbeat false feedback*, *International Multisensory Research Forum*, Dublin, 2006.

¹⁶ David Corney & R. Beau Lotto, *What Are Lightness Illusions and Why Do We See Them?*, *PLoS Computational Biology*, published September 28, 2007.

¹⁷ Pontus Larsson et al., *When What You Hear is What You See: Presence and Auditory-Visual Integration in Virtual Environments*, *Proceedings of the 10th Annual International Workshop on Presence*, Barcelona, Spain, October 25-27, 2007.

¹⁸ See Montse Benlloch, *Deliverable D1.3: Ethical Issues and Societal Impact of Presence Research*, June 30, 2007, available at http://www.cs.ucl.ac.uk/research/vr/Projects/PRESENCCIA/sharedDocuments/deliverableM18/D1.3-1-mel-revised_final.doc (last visited May 11, 2008).

constraints.”¹⁹ A case in point is the “Virtual Milgram” experiment, which was part of the predecessor project PRESENCIA²⁰ and has been widely reported in the media.²¹ In this experiment, researchers built on the legendary 1960s study by Stanley Milgram, who showed that people would administer apparently lethal electric shocks to a stranger when told to do so by an authority figure.²² The original experiment had been subject to severe criticism about its treatment of human participants, resulting in the general acknowledgment that this line of research should no longer be pursued in experimental research.²³ The Virtual Milgram experiment was based on the same setup, but used an immersive virtual environment, in which the person to be punished was an avatar and not a recognizable human being. Strikingly, even though participants knew that neither the strangers nor the shocks were real, they responded to the situation “as if it were real,” for instance with emotional distress. So does the fact that the punishment is inflicted on virtual characters change the ethical assessment of the setting?

A comprehensive answer to this question depends on many factors and will go beyond the scope of this report. However, a key aspect to consider is the gap between reality and virtual reality and the degree to which participants are aware of it. While violent actions on an avatar may trigger an automatic response by the brain and cause emotional distress, on a cognitive level participants have a broad range of unambiguous cues available and *know* that the virtual entity is not experiencing real pain. In other words, while the participant realizes the harmlessness of the situation on one level, she reacts “as if” it were real on

another. Against this backdrop, the ethical assessment would certainly not change if the participant were not aware of the fact that the tortured target was virtual and responded in exactly the same way in virtual reality as in reality. The difficult question is therefore where to draw the line when the realization of virtuality is only weak and does not obviously guide the participant’s response. Although these concerns seem serious enough to be discussed in detail, they do not indicate that experiments like Virtual Milgram should not be conducted at all. In fact, even more realistic experiments are possible today. Rather, it is important to be aware of these issues and design and conduct such experiments with the ethical challenges in mind. This would not only include assessing potential risks for the physical and emotional well-being of participants, but also asking how possible benefits of the research should be factored into the equation. Of course, such balancing of countervailing values is further complicated by the fact that potential benefits are uncertain and can only be determined in the long run.

Finally, while many of these issues are taken care of by various departmental research ethics committees, also the multidisciplinary nature of Presence research may pose some new challenges, such as the compatibility of ethics guidelines and attitudes of researchers from different disciplinary backgrounds like psychology and computer science. It may also be that the relevant research ethics committees are too unfamiliar with the nature of the technology and how people respond to it to be able to appreciate the nature of the research. While this was not a problem in the PRESENCIA project as all computer scientists involved had

¹⁹ Mel Slater, *The Whitehead Lectures on Cognition, Computation & Creativity*, Jan. 31 2007, Goldsmiths College, University of London, <http://www.goldsmiths.ac.uk/cccc/whitehead/spring07.php> (last visited May 31, 2008) (quote contained in abstract).

²⁰ See Mel Slater et al., *A Virtual Reprise of the Stanley Milgram Obedience Experiments*, PLOS One (1) 1, Dec. 20, 2006.

²¹ See, e.g., *New Scientist*, *Morals in Cyberspace*, Dec. 21, 2006, <http://www.newscientist.com/blog/technology/2006/12/morals-in-cyberspace.html> (last visited Aug. 4, 2008); John Brownlee, *The Virtual Milgram Experiment*, WIRED BLOG, Dec. 27, 2006, http://blog.wired.com/tableofmalcontents/2006/12/the_virtual_mil.html (last visited Aug. 4, 2008).

²² Stanley Milgram, *OBEDIENCE TO AUTHORITY* (1974).

²³ See, e.g., Diana Baumrind, *Some Thoughts on Ethics of Research. After Reading Milgram’s Behavioral Study of Obedience*, 19 *American Psychologist* 421 (1964); Stanley Milgram, *Issues in the Study of Obedience: A Reply to Baumrind*, 19 *American Psychologist* 848 (1964).



conducted experiments before and ethical approval was done on an institution-wide basis, this may well be an issue in other multidisciplinary Presence research projects.

2.1.1.2.2 Social Implications

While it is only possible to speculate about the broader societal implications of implementing PRESENCCIA technologies and findings on a larger scale at this point, it seems nonetheless important to think ahead and sketch the issues most likely to come up. Most of the technologies used in the experiments mediate fundamental neurological processes and therefore touch upon the core of human perception and agency, both essential for the cardinal value of individual autonomy. While BCIs basically translate thoughts into actions with real-world consequences, the research on multi-sensory Presence concerns the backchannel of experience, i.e. the way we perceive of and react to the world around us. Specifically, BCIs are said to have a broad range of applications in the fields of medicine, industry, military, and entertainment.

Virtual environments provide a more or less risk-free test-bed for prototyping BCIs. For example, errors can be easily corrected when navigating a wheelchair in a virtual environment and thus avoid the dangers of physical reality. The challenge will be rather to develop applications that are robust and reliable enough to be employed in real life contexts. For example, a real BCI-controlled wheelchair may improve the life of a tetraplegic tremendously, but comes with its own risks when used in the heavy traffic of inner-city rush hours, where a failure to accurately translate brainwaves into control signals can prove fatal. Such questions of reliability and robustness will become even more salient if BCIs will be rolled out beyond niche applications, for instance, for steering not only wheelchairs, but cars, trucks, or trains. The more people rely on the technology, the higher the stakes and potential damages in case of failure. Employing BCIs for critical and complex tasks therefore requires extensive testing, development, and quality assurance

to avoid unintended consequences. Further, by translating brainwaves into control signals, BCIs also produce vast amounts of personal information and inevitably leave a trail of personal data, potentially posing a privacy threat.

While PRESENCCIA exclusively employed “simple” EEG-based BCIs, there will almost certainly be extensions to this line of research in the future. One extension that is already experimented with by other researchers concerns the way the brainwaves are picked up. Since the degree of accuracy that can be achieved through externally applied BCIs is rather low, researchers in other projects have turned to more powerful alternatives. Brain implants allow researchers to obtain much more precise and reliable signals at much lower error rates. Such implants would be required, for instance, to achieve the degree of precision necessary to control a prosthetic limb. Another extension reverses the process and uses endogenous control signals to trigger brain activity.²⁴ Such brain stimulation promises to simulate bodily experience by directing brainwaves from the outside. While, again, such applications are not part of PRESENCCIA, it is not difficult to imagine the ethical issues and risks of abuse and manipulation that come with a technology that allows human beings to experience virtual situations as if they were real. Such ways of influencing the perception of people may not only be of interest to advertisers and marketing companies, but also to fraudsters or even oppressive political regimes.

Finally, there is the much broader and fundamental question of how these intermediaries will affect us in the long run. What does it mean for our thinking if our thoughts have immediate effects in the environment? What if the virtual and the real become so close that we confuse fiction and reality? What difference does it make for people's moral judgments if these boundaries blur? At this point, it is virtually impossible to predict the long-term biological and neurological consequences as well as the social implications arising from these. Therefore, it is important to be aware

²⁴ See, e.g., the *HIVE* project, which aims to research stimulation paradigms to design, develop and test a new generation of more powerful and controllable non-invasive brain stimulation technologies. For more information, see <http://www.hive-eu.org/>.

of the risks and learn from some of the standards and practices that have long been employed in the development of medical and pharmaceutical R&D. Or, in the case of consumer uses of these technologies (as opposed to medical settings), if for example the benefits of Presence technologies have been advertised to have beneficial effects, what can be learnt about what is acceptable or not from other experiences? In order to be prepared and accompany these emerging technologies, it will be crucial to not only follow current developments, but also find a way to make reliable predictions about their long-term impact. Methodologically, this can be achieved through a variety of forecasting methods, including scenario building and Delphi panels that triangulate the opinions of experts from academia, business, government, and civil society. In this regard, it may be helpful to draw on and learn from the experience and best practices of technological impact assessments in related fields like biotechnology and life sciences. Combining these with principles and insights from risk management and risk regulation, decision-makers will be able to devise strategies to deal with the future impacts of Presence technologies.

2.1.2 IPCity

IPCity focuses on interaction and Presence in urban environments. The project aims to investigate analytical and technological approaches to Presence in real-life settings.²⁵ According to the IPCity website, this mission translates into three aspects:²⁶ on an analytical level, the team aims to extend existing approaches to Presence by taking into account the multiplicity and distribution of events in time and space. On a technological level, mobile and lightweight mixed reality interfaces will be developed and integrated into

“the fabric of everyday life.” Finally, on a practical level, the project aims “to provide citizens, visitors, as well as professionals involved in city development or the organization of events with a set of technologies” to collaboratively envision, debate, and experience new developments and aspects of their cities.²⁷

2.1.2.1 Project Details

The project is structured around three mixed-reality research issues: Presence and experience, cross-reality interaction tools, and mixed reality infrastructure.

These themes are explored in the context of a number of sub-projects. First, the **Large-scale Events** sub-project aims to create user experience that supports the main aspects of spectatorship at large-scale events: group co-experience, engagement with an event, and navigation through space. Within this sub-project, the **CoMedia** module introduces a mobile phone application that allows users to collaboratively create stories and thus integrates real-time event information, awareness cues, and media-sharing applications.²⁸ The **Illuminate** module creates a pervasive infrastructure that illuminates people and spaces with specific colours, varying with events, places, and spectator groups. Finally, the **CityWall** module consists of a large multi-touch display installed in the city of Helsinki that acts as an interface for the changing media landscape of the city.²⁹ Passers-by are encouraged to manipulate media and learn about local events and festivals.

Second, the **TimeWarp** sub-project is a pervasive mixed-reality outdoor game in the City of Cologne, Germany, linking interactive content with actual places.³⁰ Players walk the city with portable positioning and display devices that augment the real locations with virtual objects and characters, like the

²⁵ The following description is based on the information available on the IPCity Website, <http://www.ipcity.eu/> (last visited May 11, 2008).

²⁶ See IPCity Website, <http://www.ipcity.eu/> (last visited May 11, 2008).

²⁷ See *id.*

²⁸ See Giulio Jacucci et al., *Comedia: Mobile Group Media for Active Spectatorship*, Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (2007).

²⁹ CityWall Website, <http://citywall.org/pages/about> (last visited May 11, 2008).

³⁰ Iris Herbst et al., *Multi-dimensional Interactive City Exploration through Mixed Reality*, Virtual Reality Conference 2008, VR'08, IEEE (2008).

legendary *Heinzelmannchen*.³¹ Through the technology, players experience the appearance of existing buildings in different time periods and engage with the history of the place. Instead of having to follow a predefined path to learn about the sites and history of Cologne, tourists can move freely around the city and engage in a number of games and applications.³²

Third, the *CityTales* sub-project employs a range of ubiquitous technologies in order to learn about the human-computer interaction aspects of Presence. The project's main research interest is in "the way in which the user is enabled to create a mixed reality story".³³ Four modules have been designed around a Hypermedia Database (HMDB) for managing hyperlinked media enhanced with metadata.³⁴ *BärLin*, an early prototype that was stopped after not providing satisfactory evidence, represented a metaphorical approach to Presence. It is centered around a teddy bear with a built-in video camera that allows users to film themselves while holding the doll in front of them. *Leo's Adventures* is a flash-based web service that allows users to upload and browse videos and provides simple post-production animation tools to create new mixed-reality videos. The platform is built around a narrative featuring Leo, a fictional alien, who stopped over in Berlin, Germany, to find out about human subculture and music. By uploading short videos showcasing the hot spots of the city and including the animated character Leo, users are supposed to produce the content for a real-life mixed-reality application. While the *BärLin* and

Leo's Adventures modules are supposed to provide the Hypermedia Database with content, the remaining two modules are designed to draw on it. *StreetBeat* is a location-aware music-based tour. The goal is "to immerse the 'story-browsers' into a sub-cultural story told by a professional music editor about hip areas in Berlin", creating cultural Presence.³⁵ Finally, *CityWhisper* will make available mixed-reality content accessible via a number of content browsing tools.

Fourth, the *Urban Renewal* sub-project aims to provide multidisciplinary urban-planning teams with mixed-reality technologies, emphasizing the participative and experimental aspects of urban planning.³⁶ A so-called mixed reality tent hosts the tools and applications needed to create the experience, including the *Colour Table*, the *Urban Sketcher*,³⁷ and the *Barcode Player*.

2.1.2.2 Analysis

In contrast to PRESENCIA, *IPCity* explicitly aims at mixing real and virtual environments. Thus, by default, the virtual reality elements are situated in a real-life context, from which one cannot escape. This raises a number of interesting issues both with regard to research and practical applications. Given the very applied nature of the project, there is also a significant overlap between research ethics and the broader social implications.

³¹ The *Heinzelmannchen* are a group of gnome-like fictional characters, starring in a tale written by Cologne teacher Ernst Weyden in 1826. See Wikipedia, *Heinzelmannchen*, <http://en.wikipedia.org/wiki/Heinzelmannchen> (last visited May 25, 2008).

³² For a demonstration, see *TimeWarp Cologne 2007 Video*, available at <http://www.youtube.com/watch?v=WlhFEtlzpKs&feature=related> (last visited May 25, 2008).

³³ See *IPCity Website*, *CityTales*, http://www.ipcity.eu/?page_id=11 (last visited May 25, 2008).

³⁴ See Bernhard Reitingier et al., *Deliverable D5.1: Initial Demonstrators of MR Infrastructure Components*, FP6-2004-IST-4-27571, available at <http://www.ipcity.eu/wp-content/uploads/2007/02/D5.1%20-%20Early%20Demonstrators%20of%20MR%20Infrastructure%20Components.pdf> <http://www.ipcity.eu/wp-content/uploads/2007/02/D5.1%20-%20Early%20Demonstrators%20of%20MR%20Infrastructure%20Components.pdf> (last visited May 25, 2008), at 41.

³⁵ See Sabiha Ghellal et al., *Deliverable D9.1: Demonstrator of CityTales Applications*, FP6-2004-IST-4-27571, available at <http://www.ipcity.eu/wp-content/uploads/2007/02/D9.1%20-%20Demonstrators%20of%20City%20Tales%20Applications.pdf> (last visited May 25, 2008), at 17.

³⁶ See *Urban Renewal Website*, http://www.ipcity.eu/?page_id=8.

³⁷ See *Urban Sketcher Website*, <http://studierstube.icg.tu-graz.ac.at/ipcity/sketcher.php>.

2.1.2.2.1 Research Ethics

IPCity not only develops prototypes for mixed-reality experiences, but also tests and evaluates these prototypes in field trials, using interpretative-ethnographic and quasi-experimental approaches. While it has to ensure that research design and execution adhere to the standards of the relevant ethics boards, some issues are particularly noteworthy.

First of all, participants in *IPCity* trials used the mixed-reality interfaces in real-life contexts. In the case of *TimeWarp*, *Illuminate*, or *CityWhisper*, for instance, users had to move around in the cities of Cologne and Berlin, partially among inner-city traffic that usually requires the full attention of pedestrians. In addition to wearing head-mounted displays, *TimeWarp* participants were supposed to engage with virtual objects or even virtual characters in mixed realities. Such arrangements can obviously lead to distraction. There is a risk that participants do not pay sufficient attention to the potentially physically dangerous context around them. An obvious challenge for the *IPCity* team was therefore to ensure the physical safety of participants by closely monitoring their movements and, if necessary, intervening.

This was especially important as the researchers not only had limited control over traffic, but also over other participants. For example, some researchers reported that on some occasions by-standers got irritated and even aggressive at participants using mixed-reality gear as they did not understand what was going on. Even though such incidents were fully taken into account and optimally managed by the *IPCity* team, they point to the broader social issue of clashes between people being engaged in partially different and sometimes even contradictory mixed realities sharing the same physical space.

More practical issues during the trials involved compliance with legal rules concerning data privacy, intellectual property, and content regulation. Regarding data privacy, it had to be ensured that all participants in *TimeWarp* had given meaningful consent to being video-recorded and tracked during the trials. Another potential problem concerns the privacy of people depicted in the shared content as solicited for instance for *Leo's Adventures*. In contrast to most professional

journalists, citizen contributors are not usually trained in privacy-conscious reporting and may publish their self-created material without the consent of those covered. Further, those *IPCity* services based on user-generated content like *CityWall*, *CoMedia*, *BärIn*, or *Leo's Adventures* are likely to face similar problems as other peer-to-peer file-sharing platforms. While the actual backend system for *CityWall* was handled by Flickr and consequently governed by the general Flickr user policy for mobile content, others services may have encountered the problem of anonymous users sharing and uploading potentially infringing or harmful content for immediate display. Depending on the applicable regulatory framework, this may be content considered harmful to minors, like the excessive display of violence or sexuality, hate speech, or obscene comments or statements that intentionally damage another person's reputation. These aspects could lead to further questions about the legal and ethical liability of platform providers for user-generated content. While these issues were not immediately relevant in the trials, they are likely to become more salient in future applications.

2.1.2.2.2 Social Implications

Mixed-reality technologies have a broad range of practical applications with considerable social impact. While the games and entertainment industry has already integrated simple versions of mixed reality into their products, other areas comprise training-related, industrial, as well as military applications. At any rate, the increasing commercialization of mixed-reality technologies predicted for the coming years is likely to trigger a number of difficult social and ethical issues in addition to the abovementioned legal ones.

An important ethical problem concerns the issue of deception in mixed-reality environments. By design, mixed-reality environments are supposed to augment reality with virtual elements. Deception is therefore part of the experience and naturally opens the door to new and subtle ways of manipulating user perceptions. Scenarios are mostly hypothetical at the moment, but not too difficult to imagine. For example, local storeowners may try to influence the mixed-reality appearance of their shops in *TimeWarp* to attract more customers and present them in a better

light than is warranted. Similarly, the operators of **StreetBeat** may feature specific artists or clubs without disclosing this intervention to the users. Issues like these may partially be covered by the laws concerning false advertising and product placement, which in many countries require adequate disclosure of the nature and origin of the content.

More generally, game designers may be tempted to portray the urban reality of Cologne with a certain bias, such as guiding players away from socially problematic areas and thereby invoking an overly positive perception of the city. Though this could basically happen with every guided tour, the mixed reality experience may be a special case in so far as it immerses the player in an experience that is more fundamental and manipulative than a tour in physical reality only. Another issue of deception may be the manipulation of content on installations like **CityWall** by competing businesses or agents. For example, if the wall should in fact develop into a popular point of information for citizens and tourists, rival event organizers may try to tweak the content in a way that favours their own and diminishes their rivals' events. Even though severe cases of manipulation may be dealt with under law, more subtle ways of influencing content on these platforms are likely to be much more difficult to detect.

In this regard, the **Urban Renewal** project poses different issues as it is primarily aimed at professional urban planning teams. A difficult ethical issue is again the risk of deception. Especially in urban planning projects, where the virtual is supposed to mimic the experience of a future reality as the basis for decision-making, projects may be visualized with a certain agenda in mind. Again, this is generally an issue with planning projects but seems to be particularly acute when mixed-reality applications are used. On a legal level, one can ask to what extent some of the **Urban Renewal** applications could be used to improve the efficiency of administrative planning procedures. One of the key questions here is whether citizens will in fact have a better understanding of the social implications of the project. In a social sense, the problem of the digital divide (the divide between those who access to digital technologies and those who do not) seems to be particularly relevant in this

case. As far as the **Urban Sketcher** or **Colour Table** are used as tools for public participation in the planning process, they would have to be universally and easily accessible.

An issue closely related to deception is that of fair representation. If it matters how an entity is portrayed and augmented in a mixed-reality environment, then there is a question of how control is distributed over the entity and its appearance. For example, should a shop owner in Cologne city be able to intervene if the entrance to her locale is "virtually blocked" by an oversized **Heinzelmaennchen**? Such scenarios are certain to raise a number of legal issues and will have to be judged on a case-by-case basis according to established principles of non-discrimination and equality, fair competition and advertising rules, or the protection of privacy and liability for defamation.

Another social issue may arise from the fact that most applications in the sub-projects require a certain amount of media literacy. Given the public-service character of many of these applications, this may lead to the undesired effect of privileging those who already use networked information technologies to inform themselves about events and cities while excluding those who do not have access such tools anyway, i.e. mostly elderly and socially disadvantaged people. In order to not widen this digital divide, the technologies would have to be designed with a general focus on usability and ease of access also for those who do not have extensive experience with them. In any case, it may be possible to draw on the experience with mobile phones, where similar issues about the digital divide and access for different groups have been raised.

Finally, there are a number of even broader social issues that are likely to surface the more pervasive and persistent mixed-reality applications become. In other words, when Presence technologies are mixed with the real world, there are added issues about how to cope, for example, with the space around the user (is it public or private? What kind of freedom of expression exists in this space? And the like.) For example, once users are immersed in their mixed-reality experience, there may be a need to guarantee a smooth transitioning between reality and mixed-reality environments. Also, there

is an even more fundamental risk of people with different or even incompatible mixed realities clashing. If two people move in the same space with different perceptions of realities, it is not clear how they will handle this situation. Another aspect of such a thought experiment concerns the situation when mixed realities become persistent so that one user will be able to adopt another user's mixed reality. In an even broader sense, pervasive use of mixed-reality environments may raise concerns of alienation and withdrawal from social relationships.

2.1.3 PASION

PASION is the acronym for "Psychologically Augmented Social Interaction Over Networks" and aims at providing "more efficient, effective group interactions in mediated environments."³⁸ The project is designed to achieve this goal by understanding and tracking group behavior; providing appropriate feedback services; and developing technological substitutes for traditional ways of conveying information in the context of computer-mediated communication.³⁹

2.1.3.1 Project Details

The project revolves around Shared Virtual Environments (SVE) that can be accessed from mobile terminals and partially also from desktops and immersive environments. In order to understand the strategies and patterns of interaction in large persistent social groups, two main areas of application were chosen: collaborative knowledge work and social gaming. Findings in these areas are particularly suitable for later commercialization in business models, which is one of the longer-term goals of PASION.

In the first area of collaborative knowledge work, the goal is to understand the factors that influence team performance in computer-mediated environments,

create applications that improve collaboration, and measure their impact. One of the first studies conducted in experimental settings was *Virtual Holiday*. Groups of four had the task of collaboratively organizing a vacation, using the web for information and text chat for communication. Through careful tracking and observation of participants' behaviour, it was possible to analyze group participation, group performance, and patterns of interactions.

The second area focuses on mobile social gaming. The primary goal here is to develop mobile games, in which the emotional state of a user can be communicated and manipulated. Through several studies, the project aims to understand the interplay of various social, technological, and cognitive factors that influence game performance and design applications that facilitate these tasks, for instance, by providing new channels for signalling moods and giving feedback. As in the collaborative work projects, the impact on performance will be measured, using both quantitative and qualitative tools. Among the first studies was a treasure hunting game based on *Crossfire*,⁴⁰ an adaptable multiplayer role-playing platform, on which participants used instant messaging while looking for hidden objects. One of the aspects analyzed here were how the impact of additional feedback channels and the availability of relational knowledge about a person's position within a network affected the performance and dynamics of the group.

2.1.3.2 Analysis

Even more so than IPCity, PASION research is closely aimed at real-life and commercial applications of research findings. Consequently, ethical, legal, and social issues become a major topic in the research itself, which is expressed in two reports specifically designed to address ethical issues in PASION.⁴¹

³⁸ PASION Website, <http://www.ist-pasion.com/>.

³⁹ <http://www.ist-pasion.com/>.

⁴⁰ See CrossFire Website, <http://crossfire.real-time.com/> (last visited June 28, 2008).

⁴¹ See Richard Walker et al., *Ethical Documentation for Trials*, Deliverable 1.4.2, Nov. 30, 2007; Andrea Miotto et al., *Ethical Guidelines for Pasion*, Deliverable D 1.4.1, Dec. 16, 2006.

2.1.3.2.1 Research Ethics

As far as methods are concerned, PASION uses both laboratory experiments and field trials. While the field trials have been progressing rather slowly because of technical difficulties, the focus has been on socio-cognitive and behavioural experiments that involve human subjects.

Besides the usual need for approval by institutional ethics boards, the main issue raised by PASION's research design is informational privacy. At the heart of the studies is the idea to augment conventional computer-mediated communication with additional information that has been previously gathered: information on users' emotional and cognitive states, their context in terms of location, availability and current activity, the users' roles within their social groups, and the overall dynamics of the group.⁴² Such vast amounts of data definitely qualify as personal information and are obviously socially delicate. The particular richness and sensitivity of this information puts high demands on researchers.

One of the main challenges for the project team was therefore to ensure that each participant had given meaningful informed consent before taking part in the experiments and trials. This proved to be particularly difficult in the work-related part of the project. Apparently, a lot of people refused to take part in the trial in connection with their workplace because of fears of negative consequences. This brings up the difficult question to what extent hierarchies and power inequalities in the workplace may fundamentally constrain the choices of employees and prevent any meaningful consent in the first place. While some workers may categorically refuse participation even though it would be both socially and individually beneficial, other workers may feel forced to follow the instructions of their superiors and thus not be completely free in giving consent to the comprehensive surveillance, recording, and mining of behavioural data. The problem becomes even more complex when considering that, in contrast to social gaming and leisure situations, people in the

workplace cannot normally hide behind a pseudonym. Similarly, employees may also be prevented from exercising their legal rights to personal information at a later point in time. In addition to these problems in hierarchical work situations, informed consent may be even more difficult to obtain when "negative psychological consequences" were given as an explicit reason to opt out. Reportedly, participants faced the dilemma of either taking part in a trial and revealing their psychological state, or not taking part and thereby implicitly revealing their vulnerability, too.

Particular care is further warranted with regard to PASION's extensive use of relational data in the context of social network analysis (SNA). By mining the data implicit in the relations between actors, PASION researchers gain new insights into the structure of a network. Social network analysis therefore generates a new kind of second-order personal information that is at least as sensitive as the directly observed data: for example, aggregate power hierarchies or factions in groups may be revealed by this type of analysis, quite apart from data about individuals. Most importantly, such relational meta-data could make it possible to re-identify previously anonymised participants just by their position in a social network. The targeted production and use of such data may not call for fundamentally different ethical standards, but highlights the need for increased awareness of risks to privacy in the context of large-scale social network analysis.⁴³ In PASION, the team tried to counter that risk by only providing aggregate indicator that summarize large amounts of social network data. For example, instead of exposing the exchange relationships of a specific user, the system just reveals the aggregate degree of reciprocity in a group of people.

2.1.3.2.2 Social Implications

In a hands-on project like PASION, the social implications are more or less directly related to the ethical issues that occurred during the research process. Applications for augmented communication

⁴² Richard Walker et al., *Ethical Documentation for Trials*, Deliverable 1.4.2, Nov. 30, 2007, at 9.

⁴³ See Stephen P. Borgatti & José Luis Molina, *Ethical and Strategic Issues in organizational Social Network Analysis*, 39 *JOURNAL OF APPLIED BEHAVIORAL SCIENCE* 337 (2003).

are not only the already mentioned fields of collaborative work and social gaming, but also medical applications like psychotherapy (for example, if one wanted to 'cure' the shyness or work-shyness of a worker).

Once the systems are employed on a larger scale, the possibility of negative psychological impacts is likely to become much more urgent. For example, the situation of a person already suffering from anxiety could be worsened by the realization of one's situation through implicit data that would normally not be available. An example would be an aggregate implicit measure of one's popularity that may reinforce a perception of being unpopular. Another case of adverse impact would be one that is caused by another person. For example, people may randomly gang up on somebody and start bullying the person. While such dynamics may unfold in all kinds of environments, they may be especially damaging in the context of socially augmented communication that might reveal more information about a particular person's vulnerable state than desired.

A more abstract but no less real risk concerns the possibility of surveillance of employees by their own companies. As mentioned above, the use of pervasive and ubiquitous information technology enables new forms of tracking and monitoring that may run counter to fundamental values like privacy and human dignity.⁴⁴ The moment work-related communication shifts online, behavioural data starts accruing in the systems. This opens up new possibilities of control and potential abuse that are hard to monitor and control. As the recent cases of systematic eavesdropping at companies like Deutsche Telekom AG have shown, organizations may be tempted to abuse ubiquitous personal data about employees' behaviour.⁴⁵ The same is true for government agencies that may gain access to sensitive personal data to an extent not allowed by the law.

A further question is in how far specific online collaboration tools advantage or disadvantage certain groups of people. For example, if text-based chat tools become standard means of communication, this may pose particular challenges to dyslexics and their perceived performance in the workplace. From a gender perspective, computer-mediated work collaboration does not seem likely to have a fundamental impact. One could argue that the "deindividuated" nature of online exchanges may mitigate gender-based discrimination to a certain degree since gender features of team members may not be immediately recognizable in their virtual representations. On the other hand, collaboration is not intended to be exclusively online but still be embedded in the social networks and hierarchies of the firm so that workers are likely to know the gender of the other person. The question is therefore how exactly the collaborative work environment has been designed in specific cases and whether this design can counter possible gender-related stereotypes and role clichés in the team.⁴⁶

Further, as already pointed out above, it will be important to ensure informed consent especially in unequal power relationships. Besides the already mentioned work relationships, one could imagine that especially children or elderly people may need to be protected from inadvertently disclosing too much personal information, not being able to assess the consequences of their actions in an uncertain environment. Finally, there may be a potential for distraction and addiction in mobile social gaming. Particularly children may not be aware of the costs of participating through their mobile phones.

⁴⁴ For an analysis of the implications of current and future workplace monitoring practices, see Jonathan Zittrain, *Ubiquitous Human Computing*, June 2008, available at <http://ssrn.com/abstract=1140445> (last visited June 24, 2008).

⁴⁵ *Der Spiegel*, Did Deutsche Telekom Spy on Journalists and Board Members?, <http://www.spiegel.de/international/business/0,1518,555363,00.html> (last visited June 28, 2008).

⁴⁶ See Judy Wajcman, *FEMINISM CONFRONTS TECHNOLOGY* (1991).

2.1.4 IMMERSENCE

The goal of IMMERSENCE is "to enable people to freely act and interact in highly realistic virtual environments with their eyes, ears and hands".⁴⁷ The emphasis is on a new level of immersion achieved through integrating multi-modal human senses into a single experience.

2.1.4.1 Project Details

The investigation focuses on the tactile dimension, which still lags behind the work on visual and auditory devices. Three scenarios have been developed to address the specific aspects of manual operations. First, person-to-object interaction concerns the handling of an object by a human. The main characteristic of this scenario is the passivity of the interaction partner, which only reacts in a physically predictable manner. At ETH Zurich, for example, progress has been made in the area of visual recording and replay of objects.⁴⁸ Second, person-to-person interaction involves two people that, for instance, shake hands or dance together. In this scenario, the interaction partner is no longer passive but reacts to stimuli herself. The goal in this scenario based at the TU Munich is to generate haptic feedback close to a real handshake.⁴⁹ Third, person-object-person interaction refers to complex collaborative interactions between two people mediated by an object, such as two human beings carrying a box together. This is the main focus at the Université d'Evry, where AMELIF, an integrative

framework for interaction through an object, is being developed.⁵⁰

The main method employed is large-scale interdisciplinary action in four major areas. In the area of **sensing and actuation technologies**, efforts center on the development and testing of equipment like a "tactile sensing glove," "haptic actuators based on conducting polymer," and a "sensing glove for recognising hand postures."⁵¹ As far as **rendering and display technologies** are concerned, the project focuses on the use of visual feedback in generating virtual objects, the creation of a "tactile map of forces applied in a human handshake," and the modelling of a human hand for object manipulation.⁵² With regard to **neurosciences**, research has focused on topics like "synchronising sensory stimuli from different senses," the phenomenon of "tactile suppression," and the question of how emotions are conveyed in a handshake.⁵³ In the area of **Presence measures**, findings have been recorded in the form of force patterns as the basis of a haptic language, a so-called "ground truth approach" that lets participants perform the same task in different settings from completely real to completely virtual. Another question examined is that of how to measure haptic Presence with subjective and objective measures, such as questionnaires and heart rates.⁵⁴ Besides the goal of contributing to basic research, the project is expected to have an impact especially in the area of medical training and diagnosis.

⁴⁷ IMMERSENCE Website, <http://immersence.info/>.

⁴⁸ See IMMERSENCE Website, Subsection Results: Integrated multimodal interaction systems: Actual results and publications (WP5), <http://immersence.info/> (last visited May 25, 2008).

⁴⁹ See *id.*

⁵⁰ See *id.*

⁵¹ See IMMERSENCE Website, Subsection Results: Sensing and actuation technology: Actual results and publications (WP3), <http://immersence.info/> (last visited May 25, 2008). See IMMERSENCE Website, Subsection Results: Sensing and actuation technology: Actual results and publications (WP3), <http://immersence.info/> (last visited May 25, 2008).

⁵² See IMMERSENCE Website, Subsection Results: Modeling and Rendering: Actual results and publications (WP4), <http://immersence.info/> (last visited May 25, 2008).

⁵³ See IMMERSENCE Website, Subsection Results: Neuroscientific basis for haptic interaction: Actual results and publications (WP2), <http://immersence.info/> (last visited May 25, 2008).

⁵⁴ See IMMERSENCE Website, Subsection Results: Evaluation and presence measures: Actual results and publications (WP6), <http://immersence.info/> (last visited May 25, 2008).

2.1.4.2 Analysis

Unlike PASION and IPCity, IMMERSANCE focuses on basic research.

2.1.4.2.1 Research Ethics

As far as methods are concerned, IMMERSANCE primarily relies on laboratory experiments involving human subjects. Researchers thus have to follow their integrated ethics codes to protect the autonomy and privacy of participants as has been pointed out for the other projects.

Even though IMMERSANCE and PRESENCIA are closely related in their focus and approach, IMMERSANCE exhibits some specific issues that are rooted in the nature of haptics research. Most importantly, haptic interfaces affect participants not only on a mental, but also on a physical level. The risk is thus that people may get hurt by malfunctioning technology, abuse, or other unintended events. For example, a wrongly configured artificial hand may not just press the participant's hand as in a regular handshake but actually squeeze it with brute force. Experiments involving such devices require a "red button" that allows the supervisor to stop the procedure at any time. In addition to the ethics approval required by the various home institutions, some IMMERSANCE researchers reported that their groups paid special attention to participants' needs and reactions during experiments and stopped experiments immediately if required.

As far as more invasive techniques like brain stimulation are concerned, researchers seem to pursue different approaches. While some regard the body as an essential entity in our experience of the world, others posit that even an isolated brain could experience a walk in the sun if stimulated accordingly. The debates mirror the "brain in a vat" controversy in

philosophy (i.e. the question of whether the brain can experience the world apart from the body) and has important consequences for an ethical assessment.⁵⁵

2.1.4.2.2 Social Implications

While researchers seem to agree that the area of haptics in Presence research is underdeveloped as compared to other modalities of perception, there are a couple of areas in which findings could be applied on a broader scale. One obvious candidate are games and entertainment technologies, some of which already employ rudimentary haptic devices in their latest consoles. Another area is training, like a flight simulator that simulates the physicality of flying in a real plane to prepare prospective pilots for risky situations. More generally, haptic interfaces can be applied everywhere where tasks are best done remotely. This may involve activities that are unusually risky such as dismantling a bomb. Another area are activities that require an extraordinary degree of precision like brain surgery. Since in all these fields of application, haptic interfaces mediate forces between the human body and the environment, high safety standards have to be met to provide the necessary reliability and robustness. At the moment, however, most of these applications are still in a rather early stage.

An interesting illustration of a different set of issues that may arise from the broader application of haptic interfaces is the use of robot technology for minimally invasive surgery.⁵⁶ Such technology allows surgeons to use remotely controlled robot arms to conduct surgery. Even though such techniques promise a much higher degree of precision than conventional forms of surgery, patients seem to be highly sceptical of surgical robots. Studies reported a rather low level of trust of patients in the performance of haptic technologies.⁵⁷ People were sceptical of being operated on by a "machine" instead of a real doctor, even though the

⁵⁵ See Wikipedia, *Brain in a Vat*, http://en.wikipedia.org/wiki/Brain_in_a_vat (last visited Aug. 4, 2008). The debate was initiated by Hilary Putnam, *REASON, TRUTH AND HISTORY* (1981: CAMBRIDGE: CAMBRIDGE UNIVERSITY PRESS), pp.1-21.

⁵⁶ See Barnaby J. Feder, *Prepping Robots to Perform Surgery*, *NYTIMES*, May 4, 2008, available at <http://www.nytimes.com/2008/05/04/business/04rmoll.html?ex=1367726400&en=e534281ebfeff20e&ei=5124&partner=permalink&exprod=permlink>. For an example of a manufacturer in this area, see *DaVinci Surgery Website*, <http://www.davincisurgery.com/index.aspx> (last visited Aug. 4, 2008).

⁵⁷ Miriam Reiner, *Presentation at the PEACH Summer School*, Dubrovnik, July 2008.

machine had a lower rate of error in the relevant field. This case highlights the role of soft factors in applications of Presence technologies.

2.2 Input from the Peach Community

A further source of empirical data were the various meetings of the Peach community. Over the course of the project, the research team had had the opportunity to facilitate and observe the discourse among Presence researchers, the WinG 4 community, students, and industry representatives. The meetings took place in Helsinki, Barcelona, Oxford, and Dubrovnik. The approaches taken varied from occasion to occasion. The Oxford meeting, for example, focused primarily on the social, ethical, and legal issues, and therefore provided a good opportunity to solicit views, ideas, and feedback from the Peach community specifically on certain issues. On other occasions, the research team engaged more passively in participant observation and took notes of discussions on related topics that touched upon social, ethical, and legal issues. What follows are brief reports on the outcomes of these observations and discussions.

2.2.1 Peach Meeting: (Networking session ICT06), Helsinki, November 2006

The Information Society Technology meeting in Helsinki focused on getting a broad sense of the issues. During the meeting, Peach researchers and practitioners were invited to post comments on posters. Some of them are listed here:

Where do you draw the line between Presence technologies and other technologies?

Are you for bits or matter? (me, bits)

Should discussion of ethical issues aim at researchers – or at policy and the public?

What if I want to disappear?

Should ethical and social discussion aim at current technology, or at future technologies?

Liability issues for VR content providers for real world accidents connected to their use?

Making a VR [virtual reality] tool – who has to pay for accident?

Is Mozart commercial – will his music disappear?

Concert music will disappear; people will make their own music.

What about users with special needs?

As the comments show, the workshop provided a lot of interesting discussion points, of which only a few will be highlighted here. First, users with special needs were identified as an important issue. Although there are already dedicated conferences on VR for special needs and disabilities, this concern could also be interpreted in a much wider sense: are there issues with Presence regarding people with different needs? Or put the other way around: when is a standard technology or environment sufficient, and when does it have to take into account the special needs and preferences of certain groups of users? The underlying tension here is that technologies are always designed with an "ideal" user in mind and therefore are necessarily "standardized." From an ethical point of view, this standardization may turn into discrimination if people with certain characteristics are systematically excluded. Traditionally, such differential treatment is regarded as especially problematic when it is based on categories, which cannot easily be altered like gender, race, class, or disability. A common approach in law and ethics to assess such situations is to apply the equality principle, which demands that those who are equal should be treated equally while the unequal should be treated unequally. Presence researchers and practitioners need to be aware of the problem and balance the countervailing interests on a case-by-case basis.

Liability for outcomes from VR technologies or environments was another pressing issue raised in the discussions. Who should be held accountable under what conditions for harm occurring in the context of Presence technologies? Questions of liability for artefacts have long been debated in legal contexts. Important factors for imposing legal liability are the likelihood and extent of harm caused and

the ability of certain groups of people to prevent it. Product liability regulations and tort laws, for instance, tend to prescribe different standards of liability for different products.⁵⁸ In the area of information and communication technologies, the focus has been on so-called “intermediary liability,” i.e. the question of whether and to what extent the operators of communications platforms can be held liable for damage caused by third parties on their platforms. It remains to be seen which liability regimes will be best suited for different Presence technologies once they are rolled out in a broader context.

A further concern raised in the discussions were the implications of Presence technologies for cultural production and consumption. Will Presence technologies lead to the end of recorded culture, to the end of “live” (face-to-face) performances, or to users creating their own entertainment? Music is a good example, film and theatre would be others. This is a key question where Presence technologies shade into other technologies. Recorded entertainments and culture could be superseded by other forms of performance, virtual events could replace real ones, and “social networking” models of production could crowd out industrial ones.

The question of “What if I want to disappear?” implies a scenario where users spend a lot of time in a virtual environment – with possibly profound consequences for their identities. This issue has been mostly raised in the context of gaming and social spaces applications. It may be interesting to apply this to applications other than gaming and social spaces. Finally, there are many other ethical and legal issues that could have been raised – but were not.

2.2.2 Peach Meeting: (1st WinG consultation), Barcelona, March 2007

The following is an elaborated summary of the discussion at the Peach meeting in Barcelona. At this meeting, the focus was on shared virtual environments as enabled by commercial software like Second Life or even immersive video-conferencing facilities. When

people spend a lot of time in massively multiplayer online games or other computer-mediated social spaces, they may develop a new set of relations and even close friendships. Users may achieve a strong sense of being attached to the virtual space and the objects in it. This novel form of virtual experience points to a number of social, ethical, and legal issues.

Again, a long list of questions was compiled and analyzed for major social, ethical, and legal issues. While the following summary is by no means exhaustive, it identifies five sets of concerns that were conceived of as particularly pressing.

A first set of concerns revolved around the actual and potential implications of virtual environments on an individual and social level. As far as individuals are concerned, participants pointed to a number of issues. With regard to the physical well-being of users, some researchers reported on the occurrence of motion sickness caused by certain forms of immersion in virtual environments. Others mentioned the possibility of much more complex side-effects of research uses, but also pointed out that these were still largely unknown. It was proposed to be as open and transparent as possible about these issues and share experiences in this rather new field of research. Some also asked whether medical ethics were still sufficient to cope with these challenges given the novelty of the field.

Besides concerns with the physical integrity, a major focus of the discussion was on the mental well-being of Presence users and research participants. The experience of virtual environments, it was argued, posed a range of new problems to people’s emotional and psychological states. How harmful is the simulation of reality and its experience “as if” it were real? Attendees further pointed to the difficulty of comparing virtual with conventional relationships and also mentioned the potential for addiction: what if Presence technologies achieve a level of immersion that comes close the effects of some mind-expanding drugs? But also more mundane settings like immersive virtual worlds and video games were regarded critically by some, who saw especially children at

⁵⁸ See, e.g., the Council Directive 85/374/EEC of 25 July 1985 on the approximation of the laws, regulations and administrative provisions of the Member States concerning liability for defective products.

risk of confusing what is real and what is virtual. This brought up the question of whether there may be a need in certain cases to keep people aware of the artificiality of the environments they interact in. An important question is therefore whether there should be limits to the generation and experience of Presence under certain circumstances.

A related issue brought up in the meeting was the question of learning and internalization. If users got used to certain technologies, there is a risk that they take their experience for granted. This seemed alarming to some participants, who pointed to the constant need for presence researchers to not only reflect on the benefits, but also harms of their creations. A further point was made regarding the possibility of differential impacts depending on the context in which Presence technologies are employed. It was asked, for example, to what extent company and work settings pose different problems than private and home settings.

Besides such implications for the individual user, some researchers raised concerns with the broader social implications of Presence technologies and applications. For example, it was asked whether the use of virtual conferencing or spending time in Second Life could contribute to environmental sustainability, for instance, by saving energy used for physical meetings. The discussion further focused on identifying different factors that may play a role in shaping the social implications of Presence technologies:

Do the uses of VEs and Presence technology raise different issues for research, commercial, entertainment, and military applications?

How to categorize and classify the impacts of different types of systems of Presence and related technologies – for example, immersive versus desktop, realistic versus abstract worlds?

What is the difference between routine uses of virtual environments versus experimental ones – are there different issues to consider?

Short-term versus long-term uses – what are the differences regarding social implications?

A second set of concerns related to the potential of manipulation, deception, and abuse in virtual

environments. It was pointed out that while some people may want to look like their real selves, others may choose a different appearance. One case mentioned in this context was the impersonation of one user by another through an avatar: what are the social and ethical implications of this? Is it possible to manipulate experience and influence behaviour in this way? Some attendees further mentioned the possibility of stealing someone's voice. With some Presence technologies it has become feasible to make one's voice sound like that of another person – what are the implications of this for deception? A related issue here was the observation that in some cases users may not even be aware the presence (or absence) of other people in certain places.

Many of the issues around manipulation and deception were discussed in the context of identity. For example, it was asked how identity could best be understood and dealt with in virtual environments, especially if it was not clear whether there was a real person or an electronic agent or algorithm behind an avatar. When deciding whether there is a need to grant protection to avatars, it was argued that the level of personal investment of a player in her avatar should be taken into account. This also triggered thought experiments about how individuals might be affected if their avatar "died." Should this be considered "harm" to the individual and her relationships? Finally, it was asked whether, how, and to what extent the issues of identity change and addiction might be related.

A third set of concerns focused on discrimination and equality in virtual environments. Gender issues played an important role here, asking how women are represented in virtual worlds and whether this may sustain or conflate existing stereotypes. Attendees also pointed to the possibility that Presence technologies may give an advantage mostly to men if these are early adopters. It was further considered whether women and men may experience Presence in different ways and what, if any, the consequences of this might be. More generally, it was asked whether gender issues should be divided into gender in online gaming on the one hand, and women in computing on the other. As far as the field of Presence research was concerned, it was discussed how the participation of women researchers could be promoted. Some

attendees also pondered whether there were actually any truly novel gender issues in Presence technologies.

Other areas in which discrimination and equality were argued to play an important role are gay and ethnic issues. It was asked whether people from different backgrounds may be treated differently or even more respectfully in shared virtual environments. Further concerns were raised about how to avoid exclusion, for instance, of disabled persons. Attendees pointed to well-known inequalities at the digital divide level and were concerned how differences in media literacy and access may influence the communicative opportunities of users. Finally, it was mentioned that also language barriers could play a role in shared virtual environments – what if you can't understand others, if you get treated as a foreigner?

A fourth set of concerns focused on the nature of data and its ethical treatment in virtual environments, especially privacy and intellectual property. If a device can sense what users are doing, it was asked, what are the ethical issues involved? Participants were generally concerned about the new possibilities of tracking, recording and surveillance that come with the use of Presence technologies. While it was not clear how Presence technologies fit into the emerging regime of electronic surveillance, the increasing traceability of persons and personal data was considered a major issue for the field. Among other things, it was asked whether it would be useful to make a systematic comparison between ethical and legal issues in video-capture systems like CCTV and virtual environments. A further issue that raised concerns was the possibility to sell information about people's Presence to commercial or governmental actors. For example, with a mobile phone in silent mode, it can be assumed its owner is busy, while a person active in Second Life may reveal personal preferences for certain goods or hobbies – all information that can be of substantial value to marketers or governments.

Besides privacy concerns, intellectual property was also discussed. Referring to an emerging remix and mash-up culture, some attendees asked who would pay for the creation of certain types of content in the future, while others raised the problem of whether users should be granted (intellectual) property rights to certain digital objects they created. More

specifically, attendees discussed the implication of legal ownership of virtual objects and avatar rights: whom does a virtual building or t-shirt actually belong to?

Cutting through these discussions was a more general question about the applicability and utility of existing legal regimes in virtual environments. New technologies usually challenge these normative frameworks and lead to tensions and disruptions. Some participants pointed to issues of liability and security. One example discussed was the case of mobile technologies as employed by the PAsION project. Another example comes from the IPCity project: what if a user got hurt by being directed into heavy traffic, who would be responsible: the device manufacturer, the network or service provider, or the user herself? Another issue mentioned was data security for mobile users, who want to share information across devices.

A fifth set of concerns relates to questions of governance of and in virtual environments. This was perceived as not just a matter of state law and regulation but of regimes of social norms and conventions that emerged under the specific conditions of virtual environments. Most generally, it was asked which "laws" hold in a virtual world like Second Life and who controls them: who sets the rules and enforces them, what kind of politics governs these environments?

Among the potential problems discussed were the possibility of unwanted activities or vigilante justice, such as holding an alleged perpetrator for ransom. Further, people mentioned ownership within and across different online worlds, the issue of avatar persistence, the macro dynamics of in-world economies, conflicts over virtual currencies and trade, credit card fraud, vandalism or other outright destructive behaviour.

In terms of approaches, it was asked whether and to what extent ethical and legal responsibility should be assigned to the avatar or the real person. Also markets were mentioned in this regard, both as mechanisms of regulation and as institutions that benefit from greater predictability and certainty generated by stable governance regimes. Some attendees pointed to the role of end-user license agreements (so-called

EULAs) in the governance online worlds, but also reminded the audience that most users (and especially children) cannot be expected to actually read and understand these codes as guidelines for behaviour. Generally, there was a sense that the exercise of power may not always be transparent, given the complex technological architectures involved. Finally, a number of attendees were concerned about the interaction among different governance regimes. People wondered whether there might be a need to “harmonize” these normative systems and whether the traditional divide between private and public law may hold in virtual worlds.

A final and sixth set of concerns pointed to a number of rather broad questions that relate to our understanding of social life in virtual environments more generally. For example, it was mentioned that the current uses of virtual environments, apart from research, are mainly in visualization and practical applications like therapy and training on the one hand, and entertainment, gaming and socializing on the other – what other like uses can be envisaged? And would these require differential treatment with regard to social, ethical, and legal issues? Can we distinguish between ethical and social issues in research as opposed to non-research applications? How to distinguish issues in Presence versus Co-Presence technologies – should they be kept separate at all? Tackling these questions, it was argued, not only requires reflection by Presence researchers and developers, but also input from the various other audiences involved, including actual users, non-users, and the general public. Some participants expressed the idea that especially interdisciplinary work is needed to fully appreciate the implications of social life in virtual environments.

There is a further issue in relation to the different capabilities for different types of systems: for example, in terms of avatar embodiment and how the user is tracked (some have only the position of their body tracked, others the movement of their head and arms, etc.), or in terms of what devices they have (some may have a mouse, others a 3D wand, etc), the extent to which they can change and interact with environment, and other factors. Issues here include:

what if the world withdraws support (i.e. the world is shut down), and there is little possibility to reproduce the online relations? Or if there is violence or injury or harm, if the violence is taken offline? What about legal rights to one’s online places and the objects one has developed, or ownership rights of one’s avatar? In this case, it is important to distinguish: what should be stopped for ethical reasons? What can be steered socially, or socio-legal framework for? What can be educated for? Do social issues become a bottleneck for technology development, or vice versa? What kind of devices should be developed and promoted, and what kinds of economic or commercial issues arise? This means that the social, ethical, and legal implications of Presence research cannot be divorced from the larger context of how Presence technologies are being developed, how they are currently used, and above all, the outlook for their uses.

2.2.3 Peach Meeting: (2nd WinG consultation), Oxford, April 2008

The following is a summary of the WinG 4 session on “Social and Ethical Issues” which was held on April 2, 2008 at the Oxford Internet Institute. The aim of the meeting was to solicit input from the WinG participants into the ethical, legal and gender issues of Presence technologies, and how best to address these in the Peach project.

The first part of the discussion concerned in-depth discussion of three scenarios⁵⁹:

1. Experiments carried out with Presence Technologies
2. Social Issues in Online Worlds
3. Training in Virtual Worlds

Ad 1. Experiments carried out with Presence Technologies

The most interesting case that was discussed was the PAsION project, which provides augmented cues – tools that teams can use to enhance their feeling of Co-Presence. This research takes place in a real company (Telecom Italia). Since the communication events are logged, the ethical issue that is raised is what happens when the co-workers have concerns

⁵⁹ These are also posted at <http://www.starlab.info/peach/?q=forum/1> (last visited Sept. 12, 2008).

over the privacy issues that this monitoring involves. Further, it is not clear how the information from this logging will be used and what implications this might have. It could be that people are distanced from the group if they find out about certain characteristics of the group such as to implicitly make the person aware of their distance. When there are lots of people in a social organization, there may not be good tools for recognizing characteristics of groups that don't cause conflicts of potential interest.

Why should the standards of experiments be any different from real world experiments?

If there is a negative effect of experiments, why should that be viewed any different than the effect in real world experiments? It was proposed that there were different levels of immersion involved, with some VEs offering a very real experience, others less. This needs to be taken into account.

How do you know where the boundaries are unless you do the experiment?

Guidelines on risk and ethics, and how they apply to virtual worlds (such as the American Psychological Association) need to be followed. But these also need to be updated to take into account the realities of virtual worlds

Ad 2. Social Issues in Online Worlds

There are emerging uses of Second Life (SL) for telemedicine applications – facing critical ethical issues regarding protecting patients data in SL. Even where a private island has been purchased in SL, and that portion of the island is closed for sensitive applications, this may not be sufficient. Safety here is only according to the safety policy provided by SL. On the other hand, providing facilities like SL for one's own purposes would require lots of customization and work. Linden Labs, the company behind SL, could give people interested in telemedicine applications a server. Still, first, this would mean Linden would need to be trusted. Also, patients would need to be informed about possible risks and provide signed consent. A further issue could be if there are impostors in SL – I may see the therapist, but it is not the therapist.

There are issues of property: you can own things and you own your own person. There is a need here to

separate the legal issues and ethical issues. The role of EULAs (End User License Agreements), which often reserve all rights to the developers. The current worlds are run by developers, which set the terms for worlds. Finally, with augmented reality, you can augment the knowledge of people and make new knowledge that is not accessible in the real world.

Ad 3. Training in Virtual Worlds

Training in immersive virtual environments: the problem with responsibility is more of a legal issue, rather than the first two which were more involved with ethical problems. For legal problems, you need specific cases and specific details.

What is the solution for a product liability issue like this? Disclaimer? Companies are hiring people to do training, but there is nobody to certify these poorly designed training sessions. These VEs should be treated the same as drugs and medical devices if being used in a health care setting.

Other training issues include: What are the success metrics for training? What is a good training environment? How to certify this product/service in terms of quality? What are the standards in e-learning?

In addition to these three scenarios, some other issues were raised but could not be discussed in depth due to a lack of time. These mainly concerned the role of identity and the question of whether people are playing a role or are being themselves. It was asked whether people actually want to know whether they are talking to an avatar or an agent. Also, the issue of impostors was brought up again that change identities on a daily basis to trick or deceive others. Closely related to this problem was a point raised about the desirability of allowing multiple identities in the same system. Other aspects mentioned were a possible coupling of age and social obligations and the implications of users performing multiple personas simultaneously. There is also a tension with the idea of role-playing as one of the main reasons for people to join a virtual world in the first place. A further issue was the possibility that data may be collected under the guise of a game, but is actually being used for marketing. Other issues mentioned were human rights in online worlds, exclusion and the digital divide, gender, race, and sexual identity, manipulation of people through Presence technologies.

As technology evolves, the cultural distinction between the real and the virtual may become less and less clear. So what are the ethical implications as all the ethical issues in real life move part and parcel into the virtual world?

2.2.4 Peach Summer School, Dubrovnik, July 2008

During the Peach Summer School in Dubrovnik, Ralph Schroeder and Eric Meyer (OII) conducted a session on the social, ethical and legal issues of Presence Technologies. In order to ground the session in actual research, five projects of summer school participants were selected for discussion and group analysis. What follows is a brief description of each project and the major issues that were identified during the session. Further details on these projects can be found in the summer school program.

Brain Controller: In this research, a controller is used whereby the subject has their EEG recorded and then, by focusing attention on something, he or she is able to control something, e.g. turn on a TV.

- Social issue: People that do not know how the system works may think that the system is reading their thoughts. They need to be informed that it only monitors their specific interaction. The larger issue of being able to 'read' these thoughts also deserves consideration.

Pasion project: This project, described elsewhere, conducts experiments into augmented communication in groups. The system uses social, emotional and contextual cues with group structure and can identify people's roles.

- Ethical Issue: privacy, people may not always want to share their mood or their emotional state.
- Social issue: Surveillance and the use of information: e.g. manager can see the emotional states of the staff and possibly fire them.

Emotional Management Therapy: This research is developing emotional management in VR to help people with stress and emotional management.

- Social Issue: technologists will focus on technology, often ignoring existing practice for therapy and for coping with emotions.
- Social Issue: the content of environment is a relaxing environment, but is it good for the person or will it make them feel uncomfortable?

Treating Post-Traumatic Stress Disorder (PTSD) in VR:

This research is used, among other applications, for treating soldiers coming home from war:

- Social Issue: How do we know if they are cured? Paper and pencil checklists are used to assess level of being cured, but there are often monetary and other incentives to reporting yourself as PTSD (other approaches use physical cues)
- Social Issue: the therapy may re-traumatise people, for example, using VR to move people slowly enough through the experience, but not so fast as to frighten them.
- Social Issue: If the technology is used to treat people, the military may not want to admit they are ill. VR may help de-stigmatise PTSD, for better or worse.

Use of Second Life for Therapy: This application is being developed, in research and practice, at a number of institutions.

- Ethical Issue: who is behind the avatar as therapist? The therapist and patient may be in an established relationship, but in SL it may not be possible to verify who is behind the screen.
- Social Issue: the patient cannot be sure that the therapist is the only person watching the screen
- Social Issue: All aspects of SL are recorded, even in private areas.

Besides these specific cases studies, a number of other issues were raised during the session or submitted via e-mail or text before and afterwards. Among other things, participants were concerned with the implications of Presence technologies for traditional institutions like families, friendships, dating, or even pet-human relationships. It was asked whether people might change the way they interact because of new technologies like virtual worlds, video conferences,

or mobile phones. Related concerns focused on changes in identity and self-awareness or the relative ease and low cost of spoofing and deception. It was mentioned that Presence technologies may create a “false” perception of reality and that maybe not all environments actually need to be as realistic as possible to achieve their purpose.

Further concerns related to a “virtual divide” and its potential distributional consequences. For example, it was mentioned that if it is true that VR technology helps people to get wiser; have more memory; and in general be ahead of the crowd, it might be unfair if only some people had access to this technology. Other participants were worried about a possible “disconnection” between humans and their environment if more and more activities become mediated by Presence technologies. A scenario mentioned was that of using Presence technologies in military contexts and “virtual warfare,” where people may be deprived of their ability to empathize with others or make ethical decisions. Broadly related to this aspect were more general questions about the nature of individual autonomy and free will under conditions of intermediated experiences of Presence.

Also governance issues were on participants’ minds. People raised questions about the governance regimes that will emerge in a world with multiple realities. For example, it was asked how violence may be treated when it is directed against virtual representations of people instead of real bodies. One participant mentioned the possibility of “post-humans” as a consequence of the increasingly pervasive use of Presence technologies.

With regard to research, a lot of discussion centred on the role of informed consent. Participants reported problems they faced in their own project such as the difficulty of obtaining consent in real-life experiments in virtual worlds and other public virtual spaces. Others mentioned similar problems when working with mentally impaired patients. Further concerns were raised regarding experimental research using invasive techniques. While this is generally mostly accepted with regard to animals, the field of brain stimulation was expected to pose similar ethical problems with regard to humans in the future. Participants emphasized the need to carefully

study potential health risks as far as possible before conducting the experiments. It was also mentioned that VR technologies may under certain circumstances even be a way to conduct these studies with lower risk for humans.

A final point was made about the hyperbole that is said to occur around new Presence technologies. Often new technologies were presented in an exaggerated way, giving rise to both unrealistic fears or hopes. Many people were said to make associations with popular movies like “The Matrix” when they hear about Presence technologies. Some participants even speculated that such hyperbole could also be fostered by developers, who have a strong economic interest in publicity. It was therefore asked how researchers in particular can try to resist exaggerated arguments and claims about new technologies.

3 Synthesis and Scenarios

While the previous sections have provided a rich overview of social, ethical, and legal issues in Presence research and applications, this section will extract the cross-cutting issues from the data and map them along key dimensions. This will not only make it easier to grasp the complex implications of Presence technologies, but also provide the basis for thinking about possible responses.

3.1 Key Dimensions

Based on the preceding sections, we can distinguish a number of dimensions that are useful for thinking about the social, ethical, and legal challenges.

3.1.1 Context of Use: Presence Research vs. Applications

The first dimension distinguishes between Presence research and Presence applications. This distinction seems useful because different considerations apply. In Presence research, technologies are used in the more or less controlled environments of research projects. Mostly, these take place in laboratories at universities and independent research institutions, where researchers have full control over the conditions and procedures under which Presence technologies are used by human beings. The focus here is consequently on the role of the researcher in preventing human subjects from physical or psychological harm while producing reliable and methodologically sound scientific knowledge.

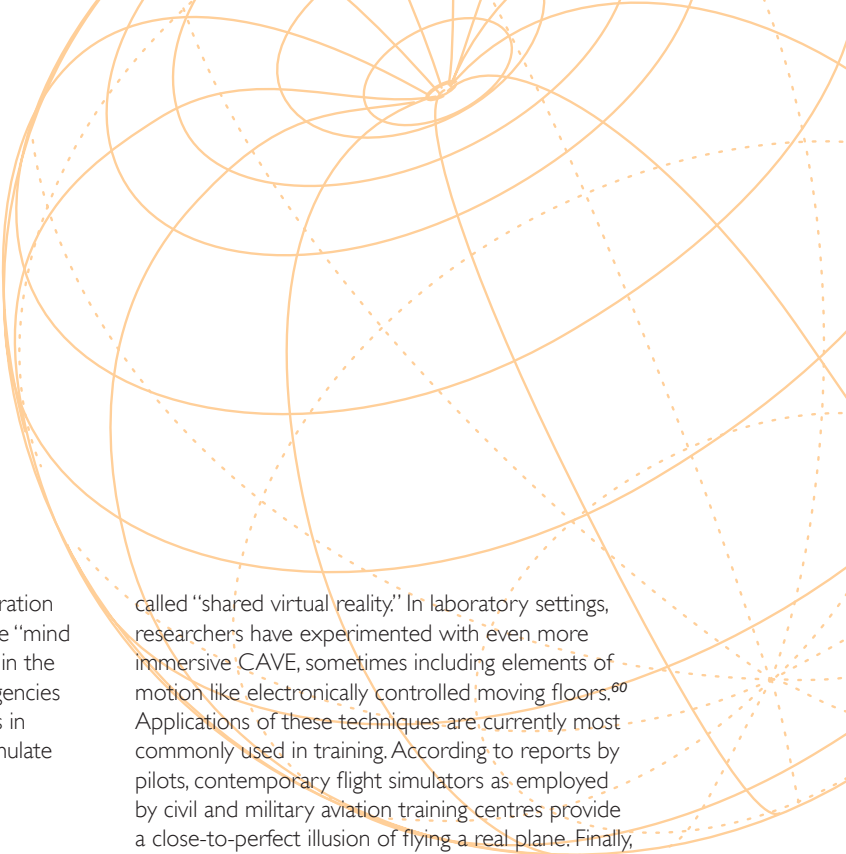
In the area of Presence applications, in contrast, Presence technologies are usually applied on a much broader scale in uncontrolled and uncontrollable environments. Relevant areas are not only the already

popular gaming and entertainment applications, but also medical, military, and industrial applications. The focus here is on uncovering existing and likely future implications of the widespread use and non-use of Presence technologies. All products have to meet the standards of product safety stipulated by the law and self-regulatory institutions with their codes of conduct. As opposed to laboratory applications, mass-marketing Presence technologies is obviously guided by commercial considerations. In other words, the areas of Presence research and applications pose different problems with different communities and stakeholders so that it seems reasonable to treat them separately for analytical purposes.

3.1.2 Degree of Uncertainty: Existing vs. Future Issues

A further dimension distinguishes between existing and future issues. As we have seen in the analysis above, in both Presence research and application a number of issues have already been identified and are open to scrutiny and careful consideration. However, as the scenarios have shown, this is only the beginning. Presence technologies are expected to be used in a much broader range of social and economic contexts and are bound to have considerable consequences, which are virtually impossible to predict.

From a social science point of view, existing and future issues therefore differ in important ways. While existing issues are open to empirical analysis and political response, future issues can only be prepared for and therefore require different methods to be tackled. This applies to a certain degree to Presence research, where new areas and methods of inquiry may pose hitherto unknown ethical problems. An



example could be the more widespread exploration of brain stimulation in the future that may make “mind control” possible. It seems even more relevant in the area of Presence applications, were the contingencies of large-scale impacts of Presence technologies in real-life situations are virtually impossible to simulate in advance.

3.1.3 Level of Immersion: Types of Technologies

Another dimension that seems useful for understanding issues is the level of immersion. From a social science perspective, immersion is closely related to awareness of the influence of Presence technologies on the mediation of perception and action. The more immersed a person in Presence technologies, the less she is aware of their existence.

As the case studies have shown, Presence technologies can mediate human perception and action in different ways. At one end of the spectrum, we can find applications on mobile phones that provide simple tools for signalling Presence, such as the mood messages and status updates as employed in the PASION project. While such representations can have a considerable impact on human behaviour, the information revealed is rather scarce and the level of immersion on part of the user low. This is different if one moves on from small displays to larger computer screens and software applications like Second Life. These virtual environments with extensive graphic animations and sound effects provide a more immersive environment for players. A next level of immersion can be achieved through technologies that more directly relate to different senses. One example are haptic devices as analyzed and developed in the IMMERSENCE project, e.g. when the pitch elevator (the mechanism which changes the angle of a plane's flight by changing its pitch) in an airplane cockpit electronically simulates wind flows and physical pressures. Another example are head-mounted displays as used in IPCity, which provide immersion at an audiovisual level creating what the researchers have

called “shared virtual reality.” In laboratory settings, researchers have experimented with even more immersive CAVE, sometimes including elements of motion like electronically controlled moving floors.⁶⁰ Applications of these techniques are currently most commonly used in training. According to reports by pilots, contemporary flight simulators as employed by civil and military aviation training centres provide a close-to-perfect illusion of flying a real plane. Finally, we can find technologies that directly interface with our brain functions and nervous system. As described in the PRESENCIA case study, BCIs can not only translate brainwaves into control signals, but also stimulate brain activity via brain implants. The latter option is not only intrusive, but also immersive in the sense that it is increasingly difficult to locate the origin and nature of perceptions and their relations with events.

3.2 Synthesis of Issue Analysis

The following table (Figure 0-1) summarizes the main issues from the empirical analysis in the previous subsection. It is structured according to the context of use, i.e. research-related and application-related issues. The case studies, in which the issues occurred, are indicated by codes: (1) PRESENCIA, (2) IPCity, (3) IMMERSENCE, (4) PASION, (5) Peach Meeting (Networking session ICT06), Helsinki, November 2006, (6) Peach Meeting (1st WinG consultation), Barcelona, March 2007, (7) Peach Meeting (2nd WinG consultation), Oxford, April 2008, (8) Peach Summer School, Dubrovnik, July 2008. In addition, the discussion is informed by the panel on social issues arranged jointly by NU and OII at the Presence 2007 conference, and the 3rd WinG consultation in Edinburgh April 2009 (which are not numbered, but included in the discussion in subsequent sections.

⁶⁰ Link to the video at <http://www.cyberwalk-project.org/> (last visited 29.3.2009).

issue	description	case study
research-related	<i>(focus on experimental research in laboratory context)</i>	
ethical vs. legal aspects in review procedures	awareness of ethical issues is not a one-time exercise to avoid legal liability, but requires ongoing reflection on the implications of research for human participants and beyond; especially important in the case of Presence technologies, where impact is often highly uncertain	(3) (7)
ethical advantages in virtual vs. non-virtual contexts	use of Presence technologies for experiments that would otherwise be not admissible under ethical considerations (e.g. Virtual Milgram)	(1)
multidisciplinary research	divergent traditions in multidisciplinary projects regarding sensitivity to ethical issues among researchers (e.g. computer science vs. neuroscience)	(1)
informed consent	informed consent may not be meaningful if obtained in settings with strong hierarchies and pressures on participants (e.g. workplace)	(4)
invasive techniques	experimental research using invasive techniques like brain implants may trigger more fundamental debate about limits of "engineering" human perception	(8)
application-related	<i>(focus on large-scale applications in everyday life)</i>	
robustness and reliability of technology	Presence technologies most likely to be used in contexts where human perception is not sufficient and technology can be employed as an extension of perception and/or action: e.g. enabling a tetraplegic to steer a wheelchair via BCI, minimally invasive surgery, controlling the pitch of an airplane, controlling a prosthetic; these tasks are mostly critical and malfunction can cause considerable damage	(1) (3)
risk of physical harm to participants	unknown long-term effects of invasive technologies like brain implants	(1)
	distraction through virtual elements in mixed-reality environments	(2)
	motion sickness and "simulation sickness"	(8)
risk of psychological harm to participants	anxiety because of perception of permanent surveillance	(5)
	connection between virtual representation and human being	(6)
broader implications for social interaction	people may experience different realities, which may lead to diverging interpretations and misunderstandings; in case of mixed-realities, "by-standers" are "users," too	(2) (5)
	users may become alienated or withdraw from non-mediated relationships	(2)
	prevent harm from non-users	(1)

	governance of large-scale interactions, like Second Life	(6)
human dignity	brain stimulation as a fundamental ethical question	(1)
privacy	technologies usually continuously track and mine personal data from interactions; tracking may even be mandated for safety reasons	(1) (2) (4)
	people may inadvertently disclose sensitive information about their friends by revealing relational data	(2)
	except for online virtual worlds, it is generally not possible to hide behind pseudonyms	(4)
	possibility of surveillance in workplace	(4)
	safe data sharing among users, e.g. on mobile devices	(6)
	users may experience processing of personal data by machines as breach of privacy	(6)
protection of users with special needs	children may need special protection as users of Presence technologies. e.g. informed consent may be problematic; often parallels to the Matrix are drawn	(4)
	disabled users may need special functionalities	(5)
technophobia, barriers to adoption	people may fear or distrust Presence technology, e.g. being treated with technology rather than directly by surgeon	(3)
	some researchers reported that virtual relationships are not perceived as good as non-virtual relationships	(6)
manipulation/deception	brain stimulation may be (ab)used for marketing, fraudsters, political regimes	(1)
	difficult to draw the line between legitimate strategic behavior and deception, e.g. when store owners try to influence the virtual appearance of their shops or people are guided away from problematic areas in mixed-reality environments	(2)
	how much control over one's appearance in these realities?	(2)
	impostors in virtual worlds, i.e. people who adopt an identity known to their audience	(7)
equality and discrimination	access to technology may decide on social opportunities; generally media literacy presupposed	(2)
	common attributes like ethnicity and sources of prejudices may be less visible and overcome traditional prejudices	(4)
	Presence technologies can produce characteristics of group, lead to exclusion	(7)
transition and adaptation	experience of having thoughts directly translated into action (BCI)	(1)
	entry/exit: need to adapt interpretive repertoire – even if goal is to just substitute reality	(5)

	impact on children in learning stage: need to know what is real and what not	(6)
	new technologies advantage men as early adopters	(6)
	addiction (gaming)	(6)
	transition between virtual and non-virtual environments needs to be managed	(2)
legal issues	legal liability of platform provider; access provider; or manufacturer for harm inflicted during use of Presence technology	(5) (6)
	legal personhood may be invoked for avatars and other representations of people	
	public/private divide challenged	(6)
	intellectual property: user-generated content in virtual environments may cause similar problems as seen in peer-to-peer file-sharing	(2)
shifts in production	new modes of production, like music or other collaboration across time and space?	(5)
	rules for Presence technologies can enable markets by reducing uncertainty	(6)

Figure 1: Overview of Social, Ethical and Legal Issues

The table shows that Presence technologies pose a rich and complex set of social, ethical, and legal issues along the three dimensions sketched above. As far as research-related issues are concerned, Presence technologies do not so much indicate fundamentally new problems, but rather add new qualities to existing ones. For example, while a concern with informed consent is hardly novel for scientists, Presence technologies are particularly critical here because the alteration of perception (which, depending on one's normative assessment, can also be called deception) is an integral part of the Presence project. Similarly, invasive techniques like brain implants may well be used in other areas of neuroscientific research, but are likely to become especially prominent in Presence-related contexts. An additional issue likely to cause ongoing debate are the potentially different ethical assessments of experiments conducted in more or less immersive virtual environments as opposed to conventional laboratory setups. The Virtual Milgram case provided a good reference point for discussing these issues.

With regard to application-related issues, the situation is more complex. Presence technologies touch upon a wide variety of interactions in different social contexts. While the nature and sensitivity of the issues can therefore differ substantially and requires a careful case-by-case evaluation, some overarching concerns can be identified. To begin with, concerns for the physical and mental well-being of participants play an important role. Presence technologies can have immediate implications for the people using them, such as motion sickness, disorientation, or anxiety. These issues are not only relevant from the perspective of affected individuals, but also for third parties. For example, technophobia may well constitute a barrier to the broader adoption of Presence technologies and would have to be taken seriously. Also privacy concerns are likely to become increasingly important since most Presence technologies process and record information commonly considered "personal." Another aspect are transitions between different experiences of Presence, which may well develop into a serious challenge for real-life applications. Finally, there is the issue of more diffuse and long-term implications, which are virtually

impossible to predict and thus pose one of the biggest challenges in the field.

A further dimension of complexity is added by issues related to social interaction with regard to Presence technologies. The cases have shown that Presence technologies do not just affect the individual using them, but also the wider social network, in which the individual user is embedded. In shaping perceptions, Presence technologies also shape social roles and behaviour towards others. These changes may be regarded as both desirable and undesirable. While Presence technologies may help overcome stereotypes, disadvantages, and disabilities, they also provide a considerable potential for deception and manipulation. For example, brain stimulation may be a fundamental improvement for people with certain diseases, but can turn into an instrument of abuse and control in the hands of the wrong people. Other instances identified in the case studies include impostors in virtual worlds or neuro-marketing in mixed-reality applications like IPCity. These social and ethical issues around "being there together" remind us that in evaluating Presence technologies, we not only have to take into account users, but also non-users as the IPCity project impressively demonstrated.

From a legal perspective, questions about the liability of operators of Presence technologies seemed most prominent. In a much broader sense, Presence technologies may challenge assumptions that are at the heart of many legal doctrines, such as the concept of personhood with regard to avatars and digital representations or the public-private distinction, which still is a conceptual hallmark of the legal systems of the European member states.

3.3 Scenarios for Future Applications

Based on the synthesis in the preceding section, it is possible to develop a number of scenarios. The goal of this section is therefore to extend the issue analysis above and illustrate the possible paths of development Presence technologies can take.

The scenarios vary in the detail that they are treated, but that should not be taken as an indication of

their importance, but simply of the space needed to explicate the key points. Each scenario is divided in background and setting, social issues, and potential solutions.

3.3.1 Scenario I – Online Virtual Worlds, Their Governance and Impacts

3.3.1.1 Background and Setting

People spend a lot of time in online virtual worlds, either for gaming or for socializing. These are Presence technologies insofar as, via 3D graphics and either text or voice communication, they provide a sense of 'being there together'. Examples include Second Life, World of Warcraft, the Sims Online, and others. This is perhaps the most commonly used form of Presence technology, and it raises a host of questions such as the impact of spending a lot of time in another reality, the rules which should govern these places, and consequences of one's online identity for one's online and offline self.

3.3.1.2 Social Issues

This can be called the online virtual worlds scenario because the VE in this case is precisely that; a social world, again, whether for playing or socializing. One question that arises in this case is to what extent these worlds should or can be governed by ethical and social rules that apply in the real world.

In this case it is necessary to take a step back and to consider how this case is publicly perceived: there is no systematic research on this topic, but (anecdotally, and from media treatments of the topic), when this topic is discussed, this scenario is typically treated as something of a joke, i.e., get a real life, or it's only a virtual death, etc. Note however that this is more of a reflection of the novelty of this technology rather than a serious attempt to grapple with the problem since there are real issues here: if people spend a lot of time in these worlds, surely the issue of whether they provide a space that is enriching or the opposite is one that should be treated as important (although it

is true that the virtual world matters less, for example, if one loses virtual money or dies in the virtual world, the consequences are not the same as in the offline world).

Still, this inability to grapple with new technologies has happened with other technologies (for example, jokes are made about genetically engineering hybrids between humans and other animals), but again, in this case, the issue is raised in this joking way because we have problems grappling with the notion of alternative worlds or identities other than our real ones. There are several key considerations for online virtual worlds: One is whether the user (player; socialiser) forms attachments that affect him or her – online or offline. Another is the ethical and social rules that govern or should govern these worlds. It is important to register here that what has happened so far in online virtual worlds is between two extremes: users have tried to implement utopian societies on the other hand, or replicated or imported real world practices into the virtual world. Note also that this is bound to be unresolved: interaction in virtual worlds will replicate or follow the real world or it will depart from it. This makes it fascinating to watch the development of these worlds, though not a great deal hinges on this because both socializing and gaming worlds are mainly used for recreation, so again, it is a question of enriching our lives or impoverishing it.

The impact of spending a lot of time in online VEs can be related to the videogames and violence or 'addiction' issue.⁶¹ The conflicting evidence or unresolved nature of the debate perhaps points to the fact that the issue must be seen in a larger context, and not just in terms of the evidence from psychological experiments. Similarly with addiction: is it appropriate to see this as a psychological condition, or should it not be framed, again, in terms of whether shared VEs enrich or impoverish our lives?

It is important to note that this highlights that these issues relate to the multi-user scenario: how I appear in a single-user world does not matter since people's self-perception matters mainly in relation to other's perceive them. The question of avatar appearance

⁶¹ See most recently, the essays in Peter Vorderer & Jennings Bryant (eds.), *PLAYING VIDEO GAMES* (LAWRENCE ERLBAUM ASSOCIATES: MAHWAH, NJ 2006).

and the avatar's capabilities for interacting matter in relation to others. This is also why the issues that have been raised in section 2 deserve attention: avatar deception and appearance and the like are not important per se, but because people spend so much time with others online.

It is thus misleading to treat the 'excessive' disappearing into or socializing in virtual worlds as somehow being unreal or an 'Ersatz' real life. Rather, the question should be: how enriching or impoverishing are the interactions in virtual worlds with avatars?

3.3.1.3 Potential Solutions

There are a myriad of ethical, legal and gender issues in this scenario, but the key question should be to consider the quality of time spent 'being there together'. This is a wide-ranging social issue, but an important misunderstanding can be avoided by not treating these worlds as completely liberating (these worlds have their own constraints and possibilities) or as being a poor substitute for real life.⁶² In this sense, these relationships should not be treated as inferior to face-to-face relationships.

3.3.2 Scenario 2 – Online and Offline Presences in Everyday Life

3.3.2.1 Background and Setting

VEs have been defined carefully here, as environments in which the user(s) experience a sense of being in a place other than the one they are physically in and interacting with it. But the line between VE technology and other technologies which afford a sense of Presence is blurring.

There is a range of devices which also afford Presence or something approximating it (Schroeder 2006b); for example Instant messaging, videoconferencing, sensors

which relay our Presence, and mobile phones which include the user's geographical position in virtual and real worlds. This scenario can be extended further: it is becoming common to talk about the user's web 'Presence' (their identity online); for example, an academic's profile of their research and interests, or a teenager's online web space in social networking sites.

3.3.2.2 Social Issues

In this case there are two main issues: the boundaries between the virtual and real worlds may be blurred, and the user's identity may become unclear.

Users can be tracked through their online Presences. For example, we will increasingly want to know: where is the other person, online or offline? And who is the other person, what are their characteristics? To do this, we are increasingly able to track the user's online and offline location through awareness: the other person is available online – through their avatar, via text, via video or voice – or they are currently in a real place because I know that they can be reached by, for example, stationary telephone, or they are at home or their workplace or are travelling something.

Note that in this case the absence of a person may define their Presence ('the person is away from their desk, so they must be travelling, or they are preoccupied in their online virtual world'). Note too that this is not just, as it is often portrayed, a question of identity deception (deliberately misleading others about one's characteristics or whereabouts) or multiple identities,⁶³ but more a question of misinformation or an overabundance of information which makes for a dangerous level of surveillance, not just by authorities and commercial actors but also by other people. In video- or virtual conferencing situation, should a person be able to misrepresent that they are present (for example, leaving their video-image or avatar switched on while they are stepping outside into the real world for a break)? It is quite likely that sensors will be able to sense our Presence, but both enabling

⁶² As has been shown in a similar context, people put a lot more into themselves and their relations with others online, or in the context of missing social cues – they develop 'hyperpersonal' relations. See Joseph B. Walther, *Computer-Mediated Communication: Impersonal, Interpersonal, and Hyperpersonal Interaction*, 23 COMMUNICATION RESEARCH 3 (1996).

⁶³ This may be described as the play with a number of identities that Sherry Turkle analyzed many years ago. See Sherry Turkle, *LIFE ON THE SCREEN* (Simon & Schuster: New York 1995).

them to do this regardless of whether we have switched them on and the opposite (requiring manual switching off and on) will be desirable in certain situations.

3.3.2.3 Potential Solutions

One solution would be to restrict the user's identity to a single valid representation of themselves and to being in a single place, real or virtual. This may be necessary for legal reasons, but it will not be feasible in many instances. Another solution, to allow the user of VEs to set their own level of transparency (ie. what they want known about themselves and their location), is desirable, but also has to be put into practice: is it feasible to force online spaces to reveal if they allow 'lurkers', people who are simply watching a space in Second Life without making themselves known? Is it possible to constantly monitor whether your status of being online via instant messaging webcam and a host of other devices is up-to-date as whether they are switched on or off, or to monitor the way you are represented on the web (perhaps by 'googling' yourself)? In short, Presence in VEs and related technologies will generate a host of social issues, but in this case the issues go beyond Presence technologies in the strict sense (being in another place and interacting with it), and shade into other technologies such as videoconferencing, social networking, Presence on the Web, mobile phones, instant messaging and the like. These digital technologies which do things apart from VEs – making others aware of us, conveying our location, creating a digital profile – go far beyond the scope of Presence and need to be seen in the wider context of digital devices in society.

3.3.3 Scenario 3 – Training in VEs

3.3.3.1 Background and Setting

Among the scenarios that have taken place and that can be envisaged are military training, driving simulations, training for dangerous situations such as firefighting, and the like. These are important because the sense of being in another place and interacting with it will carry over into subsequent uses of this training in the real world.

3.3.3.2 Social Issues

This is an issue that has been more widely discussed than others, but it boils down to how to make the link between the training and the real world situation in which it is used – that is, whether there is effective skills transfer.

3.3.3.3 Potential Solutions

Ensure that there is adequate testing of the transfer of virtually acquired skills to the real world setting. The liability of those providing and relying on the fact that the training was adequate in the event that this is not the case and there is damage (a traffic accident, a wrongful military killing) is bound to raise the question whether this was a result of the virtual training or some other factor. Nevertheless, the legal issue here is comparable to others of equipment failure, and perhaps the more important one is how useful the VE's are in this case.

3.3.4 Scenario 4 – Research in VEs with Human Participants

3.3.4.1 Background and Setting

Researchers use a VE to do experiments involving human participants that are more easily carried in a VE or that could not be carried in a real world setting.

3.3.4.2 Social Issues

The basic issues here have been discussed extensively in relation to the virtual Milgram experiment (see <http://www.peachbit.org/>, keho issue 1). Even if in this specific case, the research ethics called forth a mixed response in the ensuing online debate among researchers, it is important to widen the debate: As we have seen in other scenarios, the advantage of VEs is that we can do things that are not possible in the real world.

Also, a number of variations of virtual Milgram can be envisaged: for example, where consent has not been obtained, where cruelty is not just between an avatar and an agent but between two or more avatars. There are many possibilities, for example, for using VEs as

laboratories for psychological and sociological studies that could not be carried with real subjects face-to-face or in physical social environments.⁶⁴

3.3.4.3 Potential Solutions

The solutions in this case will be provided in one sense by research ethics committees, which will have to be involved in research of this type. However, it may also be important to have a wider debate among researchers and society-at-large about the limits of what is acceptable in a virtual setting.

⁶⁴ See Ralph Schroeder & Jeremy N. Bailenson, *Research Uses of Multi-user Virtual Environments*, in R. Lee, N. Fielding & G. Blank (eds.), *THE HANDBOOK OF INTERNET RESEARCH* (2008: London, Sage).

4 Characteristics and Challenges

The analysis of social, ethical, and legal issues in the previous sections has shown that Presence research and applications pose a number of distinct and complex social, ethical, and legal issues. The goal of this section is to flesh out the main characteristics of Presence technologies against this backdrop and sketch the challenges for the actors involved.

4.1 Key Characteristics of Presence Technologies

Based on the empirical analysis, it is possible to identify a number of key characteristics of Presence technologies that account for their role in society. A better understanding of these characteristics will allow us to think about possible solutions and approaches in a more structured and forward-looking way.

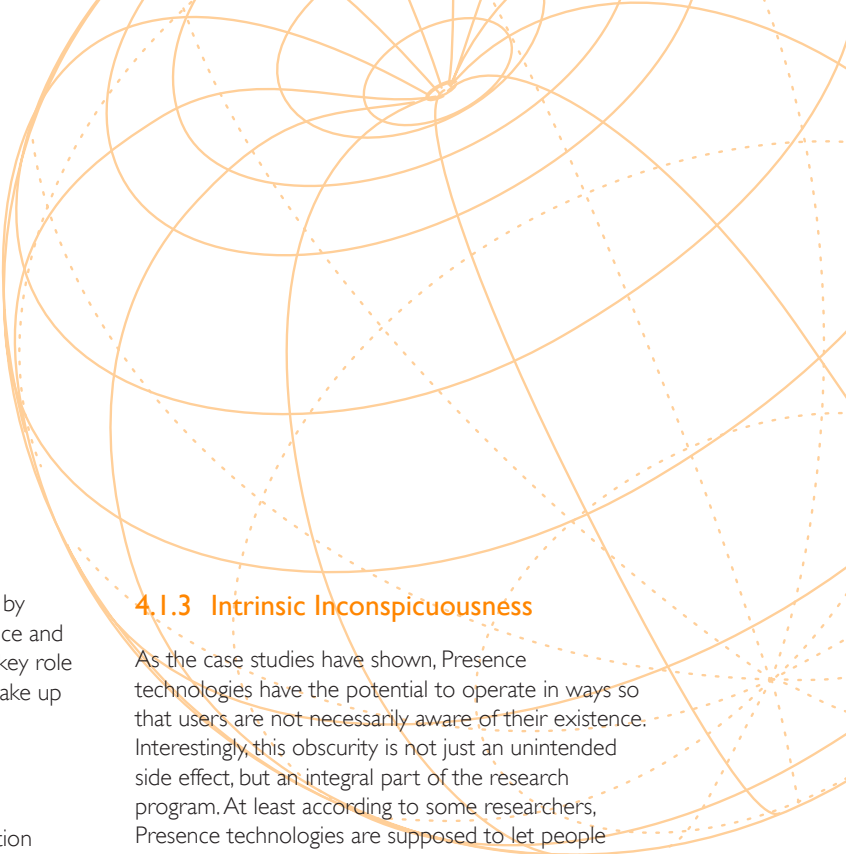
4.1.1 Intermediation of Experience and Action

A first characteristic of Presence technologies is their role in transforming our experience of the world. While function and designs of Presence technologies are highly contingent on their local use, the intermediation of experience is a feature central to all current applications. Presence technologies have the potential to enhance, amplify, distort, silence, or converge the stream of data we absorb through our traditional senses like sight, hearing, touch, smell, and taste. As the case of brain stimulation has shown, even new mechanisms of generating experience are being explored.

The process of intermediation can take different forms. Mood messages on mobile phones, for example, have been found to play an important role in how we perceive of others and cooperate in the workplace or with friends and family. Computer-based virtual worlds, head-mounted displays, or immersive CAVES can generate a more profound experience of being in a different place, time, or social context. Technologies for brain stimulation aim at translating external signals directly into brainwaves to trigger sensations for medical purposes. In all these cases, Presence technologies play an important role in configuring the ways in which we experience the world around us.

Slightly different from the abovementioned devices, brain-computer interfaces point to a further level of intermediation. As technologies for translating brainwaves back into control signals, they transform the way we act in – rather than experience of – the world. Presence technologies do not only enable the intermediation of experience but also the intermediation of action.

Of course, these processes of intermediation are closely related. For the way we experience the world plays an important role for how we act upon it. Since these actions do not take place in a vacuum, but a network of relationships with other people, they have considerable social consequences. Presence technologies therefore have the potential not only to transform our personal view of the world and how we act, but also how we *interact* with other people. Jeremy Bailenson has tried to capture this observation in the notion of “Transformed Social Interaction” and started to explore the social implications of



interactions that are at least partially mediated by Presence technologies.⁶⁵ In mediating experience and action, Presence technologies therefore play a key role in configuring the everyday interactions that make up society.

4.1.2 Emergence of Third Parties

One consequence of technological intermediation of experience and action is the emergence of a new channel for control. Technologies are usually developed, designed, and implemented with a certain purpose in mind. While they may achieve a certain degree of automation and “autonomy,” there is usually a way to influence and tweak their operations. This may seem self-evident, but is an important point to stress since it underlies many of the ethical, legal and social issues that are being discussed here. Presence technologies almost invariably mediate human experience, and thus also offer new ways of manipulating this experience. Put differently, Presence technologies bring a third party to social interactions that can have a direct influence on human perception.

As the numerous cases of actual and potential manipulation have shown, Presence technologies are bound to become a contested bottleneck that allows a certain degree of “engineering” of experience. While such engineering can be desirable to the extent that it improves human interaction or helps people with disabilities regain control over critical body functions, it could also be instrumentalised in the hope of influencing behaviour in specific ways. Commercial entities could make use of such techniques for marketing purposes, but also military and entertainment applications are conceivable. In other words, Presence technologies can be regarded as a new bottleneck to human experience and action and are therefore bound to become a part of critical infrastructure of society.

4.1.3 Intrinsic Inconspicuousness

As the case studies have shown, Presence technologies have the potential to operate in ways so that users are not necessarily aware of their existence. Interestingly, this obscurity is not just an unintended side effect, but an integral part of the research program. At least according to some researchers, Presence technologies are supposed to let people experience situations “as if they were real.” Hence, a major criterion for judging research and applications is whether they manage to make themselves invisible. The lower the awareness of users, the more effective and “successful” are the technologies considered.

Especially the Virtual Milgram study has demonstrated how difficult it can be to judge which level of awareness about the intermediation of experience is desirable from a moral point of view. While a human participant in the experiment may be aware of the virtuality of her experience at one level, she may be emotionally immersed in the specific situation at another level. This is certainly an area in which more research is needed. For the moment, however, it is important to recognize its existence and think about the social, ethical, and legal consequences.

Further, it seems that there is an inverse relationship between immersion and awareness of the intermediation of experience. The more immersive a technology, the less the user is aware of the fact that her experience is mediated. Especially in combination with the potential for third-party control, this characteristic can become important with regard to values like individual autonomy and human dignity.

4.1.4 Technological Complexity

But even to the extent that users are aware of the intermediation of experience and action, it is not necessarily easy to understand what is going on. Since Presence technologies by design interface with highly complex physiological processes, they usually reach

⁶⁵ Jeremy N. Bailenson et al., *Transformed Social Interaction: Decoupling Representation from Behavior and Form in Collaborative Virtual Environments*, 13 PRESENCE: TELEOPERATORS AND VIRTUAL ENVIRONMENTS (2004), pp. 428-441. Prof. Bailenson is a member of the Peach community and took part in the 2nd Peach Summer School in Dubrovnik. More information about him can be found at <http://communication.stanford.edu/faculty/bailenson.html> (last visited March 17, 2009).

a high level of complexity themselves. Already the technology required to credibly simulate even simple sensations like wind pressure in an electronically controlled pitch control in an airplane cockpit is considerable.

Understanding these complex relationships and mechanisms is therefore likely to remain the privilege of a small group of highly specialized experts in areas like neuroscience, computer science, and experimental psychology. Similar to many other areas in which highly complex technologies pervade social interactions, lay persons will depend on these experts for explanation, guidance, and assistance. This naturally makes it difficult for the majority of users and non-users to understand the consequences of their actions and make informed decisions about whether and how to employ Presence technologies.

4.1.5 Indeterminacy of Social Implications

A final characteristic refers to the already mentioned indeterminacy of social implications. Research in the studies of science and technology has shown that use and development of technologies are highly contingent processes that depends on a variety of social and cultural factors. It is thus virtually impossible to reliably predict the broader social and long-term implications of Presence technologies. It may be possible at least to a certain extent to assess the risk of physical harm or damage to a person. Also, some of the psychological consequences may be inferred upfront. However, as far as the broader social implications are concerned, researchers and decision-makers run inevitably into problems of uncertainty or indeterminacy. Again, the reason arguably is that to the extent that Presence technologies reconfigure experience, they also affect how we act upon it. Presence technologies are thus a prime candidate for a process which often affects technological development (though some technologies much more than others), namely unintended consequences. Social interaction is not only culturally and historically contingent, but also highly depends on the local and situational conditions. Presence technologies may therefore often bring some unforeseen results.

4.2 Challenges

Based on these characteristics, it is possible to identify a number of challenges for society, industry, academia, and public policy with regard to Presence technologies.

4.2.1 Balancing Countervailing Values

The key challenge is arguably to balance the broad range of countervailing values that are involved in any application of Presence technologies. On the one hand, the case studies have shown that Presence technologies have a considerable potential to contribute to a number of important social causes. Especially in the areas of medicine and industrial engineering, Presence technologies can enable experience in forms that have not been possible before and increase social welfare. Also the commercial potential is considerable and should not be left untapped.

On the other hand, we have seen that Presence technologies can pose a number of serious risks to fundamental values. Especially privacy, safety, and dignity concerns have figured prominently in the analysis. Any attempt at accompanying the future of Presence from a societal perspective therefore has to take into account the many trade-offs involved. As the analysis has further shown, these trade-offs can only be managed to a limited extent at the abstract level of engineering and design. Rather, users, non-users, designers, manufacturers, operators, and many other people have to work together on a daily basis to tackle the challenges when they occur and deal responsibly with any problems that come up.

The overall goal must therefore be to minimize harm to users and non-users while realizing the potential of Presence technologies.

4.2.2 Managing Transitions Between Experiences

Our experience of the world is something that we do not normally reflect upon. Rather, we take it for granted that things *are* the way we experience them. If we see another person's avatar crying, we assume she

is sad. If we feel resistance operating a pitch control on a plane, we think there is in fact some form of pressure on the wing and act accordingly. From our past experience, we have learned how to make sense and “read” the world around us.

Presence technologies alter this very process and consequently require new strategies for understanding and interpretation. This transition does not come without consequences for the people involved. While motion sickness as reported by participants in experiments is certainly among the more tangible symptoms of this process, other consequences may operate at a more subtle and less conspicuous psychological level. Acting in a modified environment requires us to update our interpretative repertoires and understanding of the world.

In other words, a key challenge for managing Presence technologies is to accompany this process of transition and design it in a way that minimizes harm to participants. This seems especially critical since unjustified fear of technologies may impede adoption and development. Managing transitions not only includes assisting users becoming proficient in a new technology, but also facilitating exit and return to a de-intermediated experience.

4.2.3 Accounting for Non-Users

A further challenge that has emerged from the case studies is the need to take also into account the different and potentially conflicting experiences of non-users. Especially in the case of mixed-reality applications, expectations can clash and lead to unpleasant and sometimes even dangerous situations. The IPCity project has shown that even though we tend to identify non-users as “bystanders,” these people are actually part of the social situation and equally affected by the user of Presence technologies. In this specific case, people got irritated and in one case even attacked a human participant wearing a head-mounted display. In other less dramatic cases, the researchers had to make sure that participants did not get distracted by their experience of mixed realities and “interact” with cars in quite consequential ways by jaywalking in heavy traffic (in other words,

have an accident!). Thus, while non-users are often overlooked in the development and design of new technologies, these cases show that they deserve heightened attention and have to be seen in close connection with the actual users and the technologies themselves.

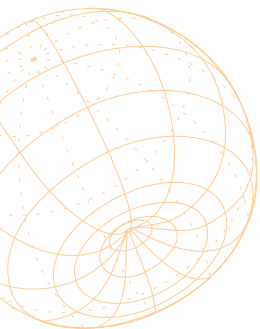
4.2.4 Coping with Uncertainty and Indeterminacy

Another challenge concerns the fact that the long-term social implications of Presence technologies are largely uncertain and indeterminate. Decision-makers therefore need to find ways to cope with a situation that is only partially amenable to pre-emptive planning. Common strategies include the monitoring of the process as well as engaging in discussions with stakeholders and affected citizens in order to identify potential problems as early as possible and take precautions. Other options include Delphi methods or scenario building, which may provide some rough guidance to those involved.

A major difficulty here is that coping with uncertainty and indeterminacy will not just require close observation of emerging trends and developments, but also understanding them. This, however, seems only possible through continuous debate with all actors involved.

Finally, it was proposed in section 4.1.1 that the intermediation of experience and action is a common underlying basis for many of the ethical, social, and legal issues relating to presence technologies. This way of thinking could be applied to a range of issues, and during the 3rd WinG consultation meeting (Edinburgh April 2009) this way of thinking was put to the test in examining the ethical, social and legal challenges in three domains: health and training, online virtual worlds, and brain computer-interfaces. It was found that although the concept of intermediation did not remove the contingency of discussing specific contexts and issues, the concept proved remarkably useful for discussing these issues. So, for example, in relation to health (online therapy) uses of presence technologies, it was suggested that in relation to problems of security and uncertainties that might arise about the relationship with the therapist (both

'intermediation' issues), the solutions were increased awareness and transparency about the technology and potentially a mix of virtual and real sessions. In relation to online spaces, to the challenge of a lack of trust in relations, gathering data without users knowledge, and uncertainty about identities and malice in relation to identity deception (again, 'intermediation' issues), it was proposed again that greater transparency and consistency of online characters would need to part of the solution. Finally, in relation to brain-computer interfaces and the possibility of producing misleading or inappropriate (for example, poor quality) experiences (again, clearly an 'intermediation' of experience), it was suggested that a greater understanding and awareness of the consequences of the effects of these mediated experiences was called for before rushing in to the use of these technologies would be a major part of the solution. In short, the concept of 'intermediation' proved very useful in guiding and focusing the discussion and proposing solutions. It also emerged that the solutions suggested centered more on the social rather than the technological side (in other words, they are not technological 'fixes' but matters of social awareness and policy).





5 Strategies and Directions

Presence research and applications are only slowly entering the public sphere. Studies like the Virtual Milgram experiment have received some media coverage. But apart from that, the future of Presence and its social, ethical, and legal implications are not yet a mainstream concern. However, this is likely to change when advances in Presence research will yield more robust prototypes.

5.1 Existing Strategies

Currently, different stakeholders employ different strategies in dealing with social, ethical and legal issues in Presence research and applications. This subsection will highlight some of the strategies observed in the case studies and address their potential and limitations.

5.1.1 Ethical Research Practices at Universities

Virtually all universities and research labs have institutionalized some form of ethical review. Applications for research projects and funding are usually screened in advance for potential ethical and legal problems and held accountable to ethics codes. Most of these procedures take place at the university level and are administered by specialized ethics committees that come from fields like psychology or medicine.

A potential problem here is that ethical review procedures are often regarded as a one-off exercise the main purpose of which is “to meet the requirements.” One reason for this attitude may be the fact that the recent rise of ethical review committees at universities has been largely motivated by fear of legal liability. Ethics reviews and practices

are therefore often shaped by more or less legal considerations, framing ethical considerations in terms of formal obligations that can be checked off like the requirement to obtain informed consent in writing whenever possible. Not surprisingly, ethical reviews are often perceived as bureaucratic and cumbersome procedures.

While the legal dimension of these exercises is without doubt important, the practice of conducting just one formalized review at the beginning of the project does not seem to do justice to the complex ethical questions. Rather, a sensitive field like Presence research requires continuous reflection on the ways in which the research process affects human participants and the researchers themselves. As one interviewee reported, some research teams may even stop an experiment if one of the **researchers** feels uneasy with the situation. In one case, reportedly, an experiment was abandoned upon the request of a researcher without a participant complaining. Such awareness, however, seems rather rare, given the enormous pressures on scientists to actually conduct studies that have been set up with substantial investments of money and time.

A further question here is to what extent researchers should take into account the broader social implications of their actions. Currently, the consensus among the Presence community seems to be that especially basic research should be conducted for the sake of research only without considering broader or even hypothetical social implications. On the other hand, there were researchers who voiced concerns and said they wanted to stay involved with the broader societal and political discussions that follow from their findings.

5.1.2 Product Development and Design

Even more than for researchers, social, ethical, and legal issues matter for developers and designers in Presence industries. New products in the field currently have to undergo the usual prototyping and testing procedures for product safety and are subject to the relevant legal frameworks. Given the limited number of widely successful Presence applications to date, it is hard to judge whether more immersive and intrusive Presence applications require a more targeted and technology-specific approach. In the past, such special arrangements have been considered for particular technologies, which were regarded as particularly risky, like nanotechnology or genetic engineering.

In general, companies usually do have a strong incentive to consider the social and ethical implications of their products from the first stages of development. For example, as the PAsION project has shown, privacy concerns have become a key issue throughout the process and have been discussed by the project team at various stages. The PAsION team even had a member dedicated to observing these issues. While this may still be an exception in R&D departments, it points to an important development that will become more and more important when Presence research is translated into mass-marketable devices.

5.1.3 Public Debate and Deliberation

Most of the issues outlined above are not yet on the agenda of the general public. In contrast to other technologies like genetic engineering or nanotechnology, there is not yet widespread media interest in the potential of Presence technologies – apart from an (often sensationalist) interest in online worlds like Second Life.⁶⁶ The reason is arguably that the consequences of Presence technologies are far from clear and very difficult to predict. In other words, a major challenge is to communicate existing research and develop scenarios, which can be understood by a broad audience.

The Peach project has been active in generating discussion in a number of ways. The website, for

instance, has attracted some debate in blog entries and comments. Video interviews on the website are available for everyone to download and listen to the opinions of leading Presence researchers. The Peach teams also have come up with a series of publicly available publication that report in non-academic and jargon-free language on the latest developments in the field.

5.2 Future Directions

While existing strategies for dealing with the social, ethical, and legal aspects of Presence technologies already appear to cover many of the most important questions, both researchers and practitioners could consider the wider and more long-term implications of these developments.

5.3.1 Academia

As has been argued above, it is critical to foster ethical reflection and considerations throughout the research process. Examples from the case studies indicate that this is very much up to the individual Principal Investigator and the culture of the team. Abandoning an experiment that has already been set up is not an easy decision that requires the support of project leaders at the very least.

One way to initiate reflection for the whole duration of the process could be to put more emphasis on the discussion of ethical issues in final project reports and publications. Such reporting requirements could encourage researcher to continuously identify and deal with ethical dilemmas. Also funding bodies can play a key role in holding grant-holders to account not only before but also after the project. Of course, the challenge of such formalized and rather administrative exercises is that the researcher may easily view this as another formal hurdle and ignore it.

5.3.2 Industry

In a similar way, product development teams in Presence-related industries need to be aware of the social, ethical, and legal issues. As has been pointed out

⁶⁶ The Virtual Milgram experiment was another instance, which received international media attention.

above, this is not just a morally rewarding exercise, but a commercial necessity. Paying attention to issues like privacy or safety pays off in the long term as it prevents companies and manufacturers from negative publicity and liability.

In the future, there may even be a point where Presence industries may also consider setting up a Code of Conduct that lays down specific obligations and best practices as they emerge from the more widespread application of Presence technologies. Examples for such initiatives can be found in the IT industry, where companies have teamed up with non-profit organizations and academic research centres to develop a code of conduct, which among other things addresses the problem of doing business in countries with oppressive regimes.⁶⁷ A similar model may be considered in the area of Presence once technologies mature.

traditionally weak and diffused voices of citizens and minorities are heard in the process. There is a range of institutions that aims to better integrate civil society and voice the concerns of often overheard factions. One example is the model of consensus conferences, originally developed in Denmark.⁶⁸ In these conferences, citizens are given a central role in assessing the impacts of technology. Thus, people without any prior knowledge of the field share their views, concerns, values, and personal experiences. Such new and innovative methods have also been employed at the EU level and in the U.S.⁶⁹

5.3.2 Public Policy

As far as public policy is concerned, a number of initiatives seem possible as the field of Presence research and applications develops. First, existing regulatory agencies and policy-makers could take responsibility for monitoring the evolution of the field of Presence. Since staying up to date with the latest developments is crucial for identifying risks, a clearinghouse could be a good starting point. This task could even be delegated to a non-profit association. Some member countries have experiences with a so-called "Office of Technology Assessment". Other countries have established special ethics councils to discuss emerging issues and give recommendations to industry and public policy.

Second, public policy could take a role in facilitating dialogue about recent developments in Presence technologies and make sure that especially the

⁶⁷ For a discussion of this approach, see John Palfrey & Jonathan Zittrain, *Perspective: Companies Need Guidance to Face Censors Abroad*, C.NET News, August 14, 2007, available at http://news.cnet.com/Companies-need-guidance-to-face-censors-abroad/2010-1028_3-6202426.html?tag=item.

⁶⁸ See *The Consensus Conference*, <http://www.tekno.dk/subpage.php?article=468&toppic=kategori12&language=uk> (last visited Feb. 3, 2009).

⁶⁹ See *EU PID Consensus Conference*, <http://www.eupidconference.com/> (last visited Feb. 3, 2009); *Broadband for All*, <http://www.broadbandforall.org/> (last visited Feb. 3, 2009).

6 Conclusions

The experience of Presence is at the core of everyday life and interactions. How we experience and make sense of the world plays a crucial role for how we think about and act upon it. Introducing technologies to change, augment, substitute, or reconfigure this process is therefore bound to raise a number of fundamental social, ethical, and legal issues.

To better understand the role of Presence technologies in social interactions, the report engaged in an in-depth analysis and discussion of the four Integrated Projects (PRESENCIA, IPCity, PASION, and IMMERSENCE) and also reported on the state of the debate in the Peach community. The analysis revealed a rather diverse set of issues and concerns that run along a number of dimensions, including context of use, degree of uncertainty involved, and level of immersion experienced by users. Mapping the issues, we found that Presence technologies not only raised new problems, but also added new qualities to existing ones. Besides questions of research ethics especially with regard to increasingly invasive techniques, concerns revolved – among other things – around the physical and mental well-being of users, issues of identity, deception, manipulation, and potential abuse, questions about privacy and the treatment of large amounts of personal data, the difficult transition between different experiences of Presence, and the challenges to existing legal frameworks.

While these cross-cutting themes emerged as abstract problems over the course of the project, it has become evident that there is no single and final set of social, ethical, and legal issues that is identical in all cases. Rather, the implications of Presence technologies are highly contingent on their situated use and local

context, which requires us to carefully consider social, ethical, and legal issues on a case-by-case basis.

Against this backdrop, it seemed useful to highlight some key characteristics of Presence technologies, including the intermediation of experience and action, the possibility of third-party intervention, the intrinsic inconspicuousness of Presence, the technological complexity, as well as the indeterminacy of social implications. This led to a number of challenges for the actors involved. Besides the need to continuously reflect on and balance a broad range of countervailing values, it seemed critical to manage transitions between experiences and also take into account those who may not have access to the technology or to the right technology but are affected by it. With Presence technologies likely to require continued attention, a key question underlying many of the issues is arguably how to best cope with the uncertainty and indeterminacy surrounding Presence technologies.

Reviewing some of the existing strategies in academia, industry, and public policy, this report discussed options for coping with these and other challenges in the future. Researchers are well advised to reflect and discuss the social, ethical, and legal implications of their research designs and findings not just at the beginning of the project, but also on an ongoing basis. Further, industry will have to cope with these issues since many of the problems outlined above can jeopardize the commercial and social success of Presence applications. Finally, public policy is called for to not only monitor and assess developments in the field, but also maintain and stimulate a lively debate about the social, ethical, and legal issues of Presence technologies.



7 Appendix

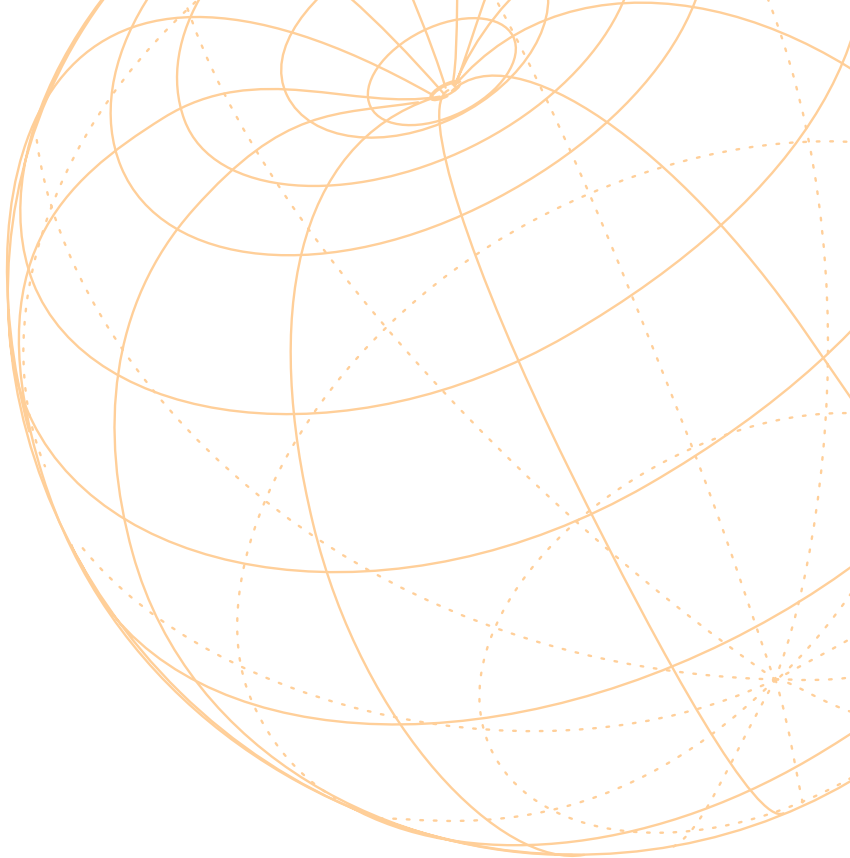
The following semi-structured interviews with Presence experts were conducted mostly during the Peach Summer School 2008 in Dubrovnik and transcribed for analysis afterwards. In addition, a large number of informal conversations and observations have been recorded in field notes and integrated into the report.

Interviewee	Project	Location & Date
Prof. Mel Slater	Principal Investigator, PRESENCCIA	Peach Summer School, Dubrovnik, July 9, 2008
Dr. Rod McCall	IPCity	Peach Summer School, Dubrovnik, July 10, 2008
Andreas Schweinberger	Manager, IMMERSENCE	Peach Summer School, Dubrovnik, July 9, 2008
Prof. Miriam Reiner	IMMERSENCE	Peach Summer School, Dubrovnik, July 11, 2008
Richard Walker	PASION	Telephone Interview, July 18, 2008
Joan Llobera	PhD Student, PRESENCCIA	Peach Summer School, Dubrovnik, July 9, 2008

Figure 2: Interviewed experts at the 2nd Peach summer school

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This report constitutes the third and final deliverable for the Peach project on social, ethical and legal issues in Presence technologies. It provides:

- an overview of these issues
- cases studies of four ongoing integrated projects (IPs) that are doing research on presence technologies
- an analysis of a number of future scenarios in key domains
- an overview of key challenges and future strategies
- a set of recommendations to researchers and policy makers

Keywords:

Ethical, Legal, Social, Gender, Presence