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## **D 2.1 [Issue 2] Social, Ethical and Legal Issues in Presence Technologies**

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## CONTRIBUTING AUTHORS

CONTRIBUTOR	INSTITUTION	CONTACT
Ralph Schroeder	Oxford Internet Institute (OII)	Ralph.Schroeder@oii.ox.ac.uk
Eric Meyer	Oxford Internet Institute (OII)	Eric.meyer@oii.ox.ac.uk
Malte Ziewitz	Oxford Internet Institute (OII)	Malte.ziewitz@oii.ox.ac.uk

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## ABSTRACT

This report analyses the ethical, legal, social and gender issues in Presence technologies.

**Please note that this second issue of the deliverable 2.1 does not include any material from the first issue of D2.1.** This second issue will be combined with the first, plus new material, into the third issue and final deliverable of D2.1 which will provide a synthetic and complete report of the WinG4 and the OII's contribution and input from the Peach partners and community.

This report has three parts:

1. An **update** about significant changes since the first report
2. An account of the ethical, legal and social aspects (ELSA)\* which emerged from the community **input** during the second meeting in March, and during the session of the summer school in July.
3. The main part of this issue is a focus on the ELSA of the four **IP projects**. This part of the report was mainly carried out by Malte Ziewitz of the OII.
4. A Summary of the Report and Outlook on future work.

\* This report will use the increasingly common abbreviation ELSA (ethical, legal and social aspects) to refer to the issues covered in this WP for presence technologies. Please note that gender issues should be regarded as included in the social aspects.

## KEYWORDS

Ethical, Legal, Social, Gender, Presence

## ACRONYMS

ACRONYM	Meaning
3D	3-dimensional
BCI	Brain-Computer Interface
EEG	Electroencephalography
ELSA	Ethical, Legal, and Social Aspects
ETH	Eidgenössische Technische Hochschule ( <i>Swiss Federal Institute of Technology</i> )
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

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## 1. UPDATE: CHANGING SOCIAL IMPLICATIONS OF PRESENCE TECHNOLOGIES

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Since the first report, there are a number of ways in which the ELSA issues have become increasingly high profile. One is that a number of conferences have been devoted to policy issues in relation to online virtual worlds, with further conferences announced for the future. The OII Peach team attended and contributed to two of these events (Cultures of Virtual Worlds, University of California- Irvine, presentation by Schroeder and Meyer, April 24-6, 2008 Virtual Policy '08, London, attended by Ziewitz, Kardefeldt-Winther, Tay and Schroeder) and it will contribute to two more (Association of Internet Researchers, Copenhagen, Workshop on Science in Virtual Worlds, Oct.20-22, 2008, presentation by Schroeder and Meyer; Research and Learning in Virtual Worlds (ReLIVE08), 20-21 November, Warwick University, presentation by Schroeder and Tay).

Two points about this development are noteworthy: One is that these conference are not purely academic conferences; some are organized outside of academic research and in conjunction with government and industry (Virtual Policy 08) and others with practitioners (ReLIVE08). At the Virtual Policy 08 conference, the talks were predominantly by speakers from industry and from government and NGO policy-related bodies. This is a new phenomenon, since previously the discussion of ELSA issues has almost entirely taken place within academic forums (including Presence 2007 and 2008, and journals), and the discussion has therefore (as pointed out in the first report) been rather theoretical rather than dealing with practical issues.

The second point is that these conferences are focused entirely on virtual worlds; in other words, online 3D worlds with large populations, primarily for gaming and socializing (Second Life, Entropia, World of Warcraft, Forterra etc) but also with strong emphasis on business uses (IBM, Cisco, representatives gave talks at the Virtual Policy 08 and were heavily represented) and also with direct interest to government (EU, UK government representatives spoke at this event).

This points to a feature of this report which should be highlighted: presence technologies, as noted in the last report, can be divided into issues that are currently related to *research ethics*, as in the IP projects and *future applications* – as against issues where there is already a *mass market* which are related almost entirely to *online virtual worlds* and where there are policy issues (regulation, legislation, consumer protection, and the like).

The OII Peach team will therefore pursue further work in this area, including investigation of educational applications, business applications and science in virtual worlds. These will be presented at several forthcoming events (ReLive08, Association of Internet Researchers, Torino Peach Industry event). The OII will also participate in a workshop about ethical issues in presence technology organized by the PASION project in October 2008 at the Presence conference.

The report will not only focus on these immediate applications. It is important to think about the implications of longer-term developments and applications, such as those when the technologies described in part 3 of this report come to fruition. The point here is merely to indicate that unlike in the past, the discussion of ELSA, at least in relation to online virtual worlds, is becoming real very quickly.

For elaboration on these points, see also:

Schroeder, R. and Bailenson, J. 2008. 'Research Uses of Multi-User Virtual Environments', with Jeremy Bailenson. In Raymond Lee, Nigel Fielding and Grant Blank (eds), *The Sage Handbook of Online Research Methods*. London: Sage, pp.327-342.

Eynon, R., Fry, J. and Schroeder, R. 2008. 'Ethics and Internet Research', In Raymond Lee, Nigel Fielding and Grant Blank (eds), *The Sage Handbook of Online Research Methods*. London: Sage, pp.23-41.

## **2. INPUT TO ETHICAL, LEGAL AND SOCIAL ASPECTS**

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### **2.1 INPUT FROM THE PEACH COMMUNITY**

The following is a summary of the WinG 4 session: 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 scenarios<sup>1</sup>:

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 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

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

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?

Other important issues – apart from these three scenarios – that were raised that could not be discussed in depth due to lack of time:

1. Identity: are people playing a role or being themselves?
  - a. You may want to know if you are talking to an avatar or an agent?
  - b. Issue of imposters – person changing identities from day to day, and using that to trick others
  - c. Allowing multiple identities on the same system
    - i. Changing social norms in relation to age of users in this regard?
    - ii. Implications of multiple personas?
  - d. Data may be collected under the guise of a game, but is actually being used for marketing. When this data and other data about you is still available many years later, what are the issues?
  - e. How do you separate out identity versus role-playing?
2. Human rights and rights in online worlds
3. Exclusion and digital divide
4. Gender / race / sexual identity
5. Manipulation of people per se
  - a. Tools that let you easily manipulate others, convince them of things, of which you wouldn't be aware

6. As technology evolves, the clear cultural distinction between the real and the virtual (is there one now?) may become less and less clear – what is the ethical implication as all the ethical issues in real life move part and parcel into the virtual world?

### **Conclusion**

Much more deep exploration of these issues is needed, but the session was useful in clarifying certain issues (training being a legal, not so much an ethical issue, for example). This was a very productive WinG session.

## **2.2 INPUT FROM THE SUMMER SCHOOL SESSION ON SOCIAL AND ETHICAL ISSUES**

During the Summer School, four research topics were selected for discussion. The aim was to ground the discussion of ethical, legal, social and gender issues in the context of real research and its future applications. Details of the research 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 about 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 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.

## **A Range of Other Issues were raised during the Session or submitted via text (they have been edited for clarity and style):**

How do or will virtual characters affect or blur the emotional relationships in families? What will future families look like, for example a woman raising children alone and with a virtual father, taking the role of the real? Or can virtual animals replacing real animals like pets?

Are people changing the way they interact because of technological innovation such as internet, Second Life, video conferences, cell-phones, and the like? Are the physical interaction among humans changing?

Spoofing or making false identities in a digital world is very easy, and when presence technology will be deployed in the long-term future, this will become a major ethical, legal and social issue.

Will we lose our actual identities if we represent ourselves by avatars? For example, will clinically over/underweight people just alter their avatar and risk continuing health problems? Arguably this is already happening with web 2.0 technologies, but could VR make this worse?

If a video game is an interactive shooting game can it be too real? Where do you draw the line? What could the psychological effects be?

Does presence create a false perception of reality?

Can we experiment on mentally impaired patients just because they are put in a "safe" environment, without obviously getting their informed consent?

If for my experiments in collaborative virtual environments, all activity is recorded to disk (e.g. movement of avatars, audio/text communication). The consent form is signed for this. What if the experiments were in public VEs (e.g. Second Life) with random people joining in, and people's avatars, behavior and communication is being recorded: should one get consent from everyone involved, and if so how?

Simulator sickness for experiment participants: how to cope with this?

Is it necessary to make the term VR more transparent to society? If you ask normal people on the street, they often have ungrounded fears or exaggerated hopes in VR-Technology - e.g. associating it with films like The Matrix because they are not informed about where technology stands right now. Developers often fan these prejudices out of economical reasons.

Confusion with reality: People will think that what they are experiencing is real and some behaviours which are not acceptable in actual society can be translated into real life. This may cause mental confusion and possible psychological problems.

Are realistic virtual environments necessary for all applications?

What if taking over a virtual identity and having a virtual life is much more a positive experience than real life, how may this affect the functioning of people in real life?

In altering our image to the rest of the world; Transformed Social Interaction (see the work of Bailenson that was presented at the Peach summer school 2008) raises many issues: What will happen when we can be anything we want, at any given time, at any given place, with anybody we chose? What will remain of the concept, and legal implications, of identity? How will we know that who we are talking to is who they say they are? If they are human, or agents, or post-humans (dead people who have mapped their selves digitally)?

If VR technology helps people to get wiser, have more memory, and in general be ahead of the average people, would it not be unfair that only rich people would have access to this new technology?

An important legal issue will be rights management of digital contents such as avatars. How will it be managed? Who will manage and enforce intellectual property rights of digital contents?

In a military context, do we really want the situation where avatars and robots are used to carry out wars? Is there the possibility that this will cause a disconnection from the reality of war?

Remote location technologies may invade people's privacy. What will be the implications?

Will the use of presence technology reduce employment opportunities?

Considering the success of on-line dating websites, that still lead most of the time to a physical encounter, what if people start going on dates from the comfort of their own home, hidden behind their idealized avatar? What impact will it have on social interactions and real-life relationships?

A legal issue: Imagine an environment where wealth and resources (e.g. land) are built up by working in a virtual environment (like Second Life). What if someone hacks into the system and steals some resources that are worth real money but were built up entirely from virtual work? How should these systems be policed?

Using VR for mental health problems (treatment of phobias) may introduce new fears.

Is it ethically correct to provide society with Presence Technology without studying the health risks of this medium to individuals and society? (During the summer school talks, there were presentations about reprogramming the brain, for example.)

A distortion of society: With the increase of virtual environments and presence, people will tend to create their own societies and their own rules, creating anarchy and individual social systems that won't contribute to the development of society.

Brain-computer interfaces are being used as input devices: can we imagine in future a similar device that can be used as an output one?

What if a person 'cheats on' their significant other with a virtual person behind which there is a real person (although this real person has not and will never be met in the real world)?

Experimental animal research using invasive techniques is mostly accepted, but not in humans (although there is an increasing interest). However, it seems inevitable that all these developments have to be tested in the near future before their integration in our lives, and VR can play a role here.

Can we, as humans, lose the sense of identity?

Will we get addicted to the high-tech solutions for VR and live lives that are not ours? Will AI get control over this technology and use us?

Is an avatar a person? If they act and appear to be a person, is it possible to assault/abuse them, for example? More specifically, is the issue the effect on the victim or the act itself?

What if virtual worlds become the only worlds and people never meet face to face?

Will people in the future be able to distinguish between reality and virtual content?

If we can model accurately human cognition and behaviours, then what becomes of the so called free will?

Some of Bailenson's Transformed Social Interaction work (presented at the Peach summer school 2008) looked at putting your own photo on adverts to make them more effective. What if a program could automatically use your personal info (e.g. your profile picture from a social networking site or even from your university web page) to target web advertising? This could even be done by morphing your face with that of an advertiser by 40% so you wouldn't even notice?

There may be problems about adjusting to re-entry in the "real world" - if presence research and technology improve readjusting to the real world, problems are also foreseeable.

Should I be virtually imprisoned, if I kill an avatar in a virtual world? virtual violence regulations!

If life takes place in a virtual environment, and people use these applications without control and without limitations for extreme or wrong behaviors, society as we know it now can disappear.

Can virtual travels be as realistic as real ones?

Will implanted chips in human brain be socially accepted, for example if subject-specific mixed/augmented virtual environments are developed for daily life?

Will agents have eventually the same rights as humans? Post-humans?

### **3. ETHICAL, LEGAL, AND SOCIAL ISSUES IN THE INTEGRATED PROJECTS (IPs)**

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(The work for this report was carried out by Malte Ziewitz at the OII under the supervision of Ralph Schroeder.)

Although all four Integrated Projects (IP) 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 – with quite different potential applications. The aim of this report is to scope the PRESENCIA, IPCity, PASION, and IMMERENCE projects and give an overview of the related ethical, legal, and social issues. Each project is introduced with a short summary of its goal and structure before the two categories “Research Ethics” and “Social Implications” are analyzed in greater detail. While the former focuses on issues that arose while conducting the research, the latter attempts an outlook on the – in most cases potential – mid- and long-term implications of the findings and their application in society.

The overview is mainly based on a review of available project reports and deliverables as of July 2008 as well as interviews with key researchers from each project that were mostly conducted during the PEACH Summer School 2008 in Dubrovnik.<sup>2</sup>

#### **3.1. PRESENCIA**

PRESENCIA stands for “Presence: Research Encompassing Sensory Enhancement, Neuroscience, Cerebral-Computer Interfaces and Applications” and is the successor of the PRESENCIA project.<sup>3</sup> 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.<sup>4</sup> 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 an empirical and statistical basis for presence, gather data on the unity of perceptual experience, and examine spatial presence at the cellular level.

##### **3.1.1 Project Details**

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<sup>2</sup> See Appendix for an overview of interview partners. We would like to thank the interviewees for their time and contribution of their expertise.

<sup>3</sup> PRESENCIA Website, <http://presencia.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).

<sup>4</sup> See Mel Slater, Presentation about PRESENCIA at the PEACH summer schools, Santorini 2007 and Dubrovnik 2008.

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 artifacts 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 imagery<sup>5</sup> or using the brainwaves of a tetraplegic to control the movements of a wheelchair in a virtual environment<sup>6</sup>. 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<sup>7</sup>, lightness illusions and why we see them<sup>8</sup>, or auditory-visual integration in virtual environments<sup>9</sup>.

### 1.1.2 Ethical, Social, and Legal Issues

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

#### 1.1.2.1 Research Ethics

The first category deals with research ethics. Virtually all PRESENCIA 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 PRESENCIA team took on these issues right from the start and commissioned a report that specifically addresses the ethical dimension of their research.<sup>10</sup>

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<sup>5</sup> 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.

<sup>6</sup> 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.

<sup>7</sup> Ana Tajadura, Aleksander Väljamäe & Daniel Västfjäll, *Affecting emotional experience with auditory-vibrotactile heartbeat false feedback*, International Multisensory Research Forum, Dublin, 2006.

<sup>8</sup> David Corney & R. Beau Lotto, *What Are Lightness Illusions and Why Do We See Them?*, PLoS Computational Biology, published September 28, 2007.

<sup>9</sup> 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.

<sup>10</sup> 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/PRESENCIA/sharedDocuments/deliverableM18/D1.3-1-mel-revised\\_final.doc](http://www.cs.ucl.ac.uk/research/vr/Projects/PRESENCIA/sharedDocuments/deliverableM18/D1.3-1-mel-revised_final.doc) (last visited May 11, 2008).

One of the key issues in the PRESENCIA 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 constraints."<sup>11</sup> A case in point is the "Virtual Milgram" experiment, which was part of the predecessor project PRESENCIA<sup>12</sup> and has been widely reported in the media<sup>13</sup>. 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.<sup>14</sup> 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.<sup>15</sup> 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.

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<sup>11</sup> 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).

<sup>12</sup> See Mel Slater et al., *A Virtual Reprise of the Stanley Milgram Obedience Experiments*, PLOS One (1) 1, Dec. 20, 2006.

<sup>13</sup> 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](http://blog.wired.com/tableofmalcontents/2006/12/the_virtual_mil.html) (last visited Aug. 4, 2008).

<sup>14</sup> Stanley Milgram, OBEDIENCE TO AUTHORITY (1974).

<sup>15</sup> 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).

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. 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 PRESENCCIA project as all computer scientists involved had 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.

#### 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 testbed 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 PRESENCIA 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. Such brain stimulation promises to simulate bodily experience by directing brainwaves from the outside. While, again, such applications are not part of PRESENCIA, 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 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. 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.

### **3.2. 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.<sup>16</sup> According to the IPCity website, this mission translates into three aspects:<sup>17</sup> 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.<sup>18</sup>

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<sup>16</sup> The following description is based on the information available on the IPCity Website, <http://www.ipcity.eu/> (last visited May 11, 2008).

<sup>17</sup> See IPCity Website, <http://www.ipcity.eu/> (last visited May 11, 2008).

<sup>18</sup> See id.

### 3.2.1 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.<sup>19</sup> The *Illuminate* module creates a pervasive infrastructure that illuminates people and spaces with specific colors, 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.<sup>20</sup> 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.<sup>21</sup> Players walk the city with portable positioning and display devices that augment the real locations with virtual objects and characters, like the legendary *Heinzelmännchen*<sup>22</sup>. 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.<sup>23</sup>

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<sup>19</sup> See Giulio Jacucci et al., *Comedia: Mobile Group Media for Active Spectatorship*, Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (2007).

<sup>20</sup> CityWall Website, <http://citywall.org/pages/about> (last visited May 11, 2008).

<sup>21</sup> Iris Herbst et al., *Multi-dimensional Interactive City Exploration through Mixed Reality*, Virtual Reality Conference 2008, VR'08, IEEE (2008).

<sup>22</sup> The *Heinzelmännchen* are a group of gnome-like fictional characters, starring in a tale written by Cologne teacher Ernst Weyden in 1826. See Wikipedia, *Heinzelmaennchen*, <http://en.wikipedia.org/wiki/Heinzelm%C3%A4nnchen> (last visited May 25, 2008).

<sup>23</sup> For a demonstration, see *TimeWarp Cologne2007 Video*, available at <http://www.youtube.com/watch?v=WlhFEtlzpKs&feature=related> (last visited May 25, 2008).

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".<sup>24</sup> Four modules have been designed around a Hypermedia Database (HMDB) for managing hyperlinked media enhanced with metadata.<sup>25</sup> *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.<sup>26</sup> 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.<sup>27</sup> A so-called mixed reality tent hosts the tools and applications needed to create the experience, including the *Colour Table*, the *Urban Sketcher*<sup>28</sup>, and the *Barcode Player*.

### 3.2.2 Ethical, Social, and Legal Issues

In contrast to PRESENCCIA, *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.

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<sup>24</sup> See IPCity Website, *CityTales*, [http://www.ipcity.eu/?page\\_id=11](http://www.ipcity.eu/?page_id=11) (last visited May 25, 2008).

<sup>25</sup> See Bernhard Reitingger, Markus Sareika, Antti Juustila, Jan Ohlenburg, Morten Friesgaard Christensen & Valerie Maquil, 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> (last visited May 25, 2008), at 41.

<sup>26</sup> See Sabiha Ghellal, Rod McCall, Theo Humphries, Joachim Rothauer, Deliverable D9.1: Demonstrator of City Tales 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.

<sup>27</sup> See Urban Renewal Website, [http://www.ipcity.eu/?page\\_id=8](http://www.ipcity.eu/?page_id=8).

<sup>28</sup> See Urban Sketcher Website, <http://studierstube.icg.tu-graz.ac.at/ipcity/sketcher.php>.

### 3.2.2.1 Research Ethics

*IPCity* does not only develop 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 did not only have 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*, *BärLin*, 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.

### 3.2.2.2 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 favors 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 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 the question of fair representation. If it in fact matters how an entity is portrayed and augmented in a mixed-reality environment, then there is a question of how much control the owner of the entity should have over its appearance. For example, should a shop owner in Cologne city be able to intervene if her entrance is "virtually blocked" by an oversized *Heinzelmaennchen*? Such scenarios are also certain to raise some legal questions, specifically around intellectual property.

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.

Finally, there are a number of even broader social issues that are likely to surface the more pervasive and persistent mixed-reality applications become. 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.

### **3.3. PASION**

PASION is the acronym for "Psychologically Augmented Social Interaction Over Networks" and aims at providing "more efficient, effective group interactions in mediated environments."<sup>29</sup> 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.<sup>30</sup>

#### **3.3.1 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' behavior, 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 signaling 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*<sup>31</sup>, 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.

#### **3.3.2 Ethical, Social, and Legal Issues**

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<sup>29</sup> PASION Website, <http://www.ist-pasion.com/>.

<sup>30</sup> <http://www.ist-pasion.com/>.

<sup>31</sup> See CrossFire Website, <http://crossfire.real-time.com/> (last visited June 28, 2008).

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.<sup>32</sup>

### 3.3.2.1 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 behavioral 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.<sup>33</sup> 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 behavioral 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.

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<sup>32</sup> 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.

<sup>33</sup> Richard Walker et al., *Ethical Documentation for Trials*, Deliverable 1.4.2, Nov. 30, 2007, at 9.

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 anonymized 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.<sup>34</sup> In PASION, the team tried to counter that risk by only providing aggregate indicators 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.

### 3.3.2.2 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 are not only the already mentioned fields of collaborative work and social gaming, but also medical applications like psychotherapy.

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.

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<sup>34</sup> See Stephen P. Borgatti & José Luis Molina, *Ethical and Strategic Issues in organizational Social Network Analysis*, 39 JOURNAL OF APPLIED BEHAVIORAL SCIENCE 337 (2003).

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.<sup>35</sup> The moment work-related communication shifts online, behavioral 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' behavior.<sup>36</sup> 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 whether the collaborative work environment is immersive enough to counter possible gender-related stereotypes and role clichés in the team.<sup>37</sup>

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.

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<sup>35</sup> 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).

<sup>36</sup> 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).

<sup>37</sup> See Judy Wajcman, *FEMINISM CONFRONTS TECHNOLOGY* (1991).

### **3.4. 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”.<sup>38</sup> The emphasis is on a new level of immersion achieved through integrating multi-modal human senses into a single experience.

#### **3.4.1 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.<sup>39</sup> 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.<sup>40</sup> 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.<sup>41</sup>

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<sup>38</sup> IMMERSENCE Website, <http://immersence.info/>.

<sup>39</sup> See IMMERSENCE Website, Subsection Results: Integrated multidimensional interaction systems: Actual results and publications (WP5), <http://immersence.info/> (last visited May 25, 2008).

<sup>40</sup> See id.

<sup>41</sup> See id.

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."<sup>42</sup> As far as *rendering and display technologies* are concerned, projects focus 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 modeling of a human hand for object manipulation.<sup>43</sup> 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."<sup>44</sup> 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.<sup>45</sup> 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.

### 3.4.2 Ethical, Social, and Legal Issues

Unlike PASION and IPCity, IMMERSENCE focuses on basic research.

#### 3.4.2.1 Research Ethics

As far as methods are concerned, IMMERSENCE 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 IMMERSENCE and PRESENCIA are closely related in their focus and approach, IMMERSENCE 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 IMMERSENCE researchers reported that their groups paid special attention to participants' needs and reactions during experiments and stopped experiments immediately if required.

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<sup>42</sup> See IMMERSENCE Website, Subsection Results: Sensing and actuation technology: Actual results and publications (WP3), <http://immersence.info/> (last visited May 25, 2008).

<sup>43</sup> See IMMERSENCE Website, Subsection Results: Modeling and Rendering: Actual results and publications (WP4), <http://immersence.info/> (last visited May 25, 2008).

<sup>44</sup> See IMMERSENCE Website, Subsection Results: Neuroscientific basis for haptic interaction: Actual results and publications (WP2), <http://immersence.info/> (last visited May 25, 2008).

<sup>45</sup> See IMMERSENCE Website, Subsection Results: Evaluation and presence measures: Actual results and publications (WP6), <http://immersence.info/> (last visited May 25, 2008).

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.<sup>46</sup>

#### 3.4.2.2 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 or doing construction work in deep water. 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 minimal invasive surgery. Such technology allows surgeons to use remotely controlled robot arms to conduct surgery.<sup>47</sup> Even though such techniques promise a much higher degree of precision than conventional forms of surgery, patients seem to be highly skeptical of surgical robots. Studies reported a rather low level of trust of patients in the performance of haptic technologies.<sup>48</sup> People were skeptical of being operated on by a "machine" instead of a real doctor, even though the machine had a lower rate of error in the relevant field. This case highlights the role of soft factors in applications of presence technologies.

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<sup>46</sup> See Wikipedia, *Brain in a Vat*, [http://en.wikipedia.org/wiki/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, 1981. *Reason, Truth and History*, Cambridge: Cambridge University Press, pp.1-21.

<sup>47</sup> See Barnaby J. Feder, *Prepping Robots to Perform Surgery*, NY TIMES, May 4, 2008, available at <http://www.nytimes.com/2008/05/04/business/04moll.html?ex=1367726400&en=e534281ebfef20e&ei=5124&partner=permalink&exprod=permalink>. For an example of a manufacturer in this area, see DaVinci Surgery Website, <http://www.davincisurgery.com/index.aspx> (last visited Aug. 4, 2008).

<sup>48</sup> Miriam Reiner, Presentation at the PEACH Summer School, Dubrovnik, July 2008.

## 4. SUMMARY AND OUTLOOK

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This section summarizes the key points of this report and outlines the next steps to be taken.

**Part 1** (Update) pointed to the fact that ethical, legal and social issues are now becoming a real and increasingly prominent theme in public discussion, especially among decision-makers and practitioners in government, commerce and related areas, and especially in relation to online virtual worlds. This prominence should not detract from the longer-term issues in research (such as those discussed in Sections 2 and 3 of this report), but the relation between current policy issues and longer-term implications of presence technologies will need to be discussed explicitly in the final deliverable.

The issues raised in **Part 2** (Input to Ethical, Legal and Social Aspects), combined with the inputs to the previous deliverable report, now means that there is a detailed and extensive (though perhaps not exhaustive) catalogue of these aspects and issues. Once they have been put into a framework which crystallizes the main themes, these issues will be analyzed with a view to providing approaches and solutions to address them.

As the analysis in **Part 3** (ELSA Issues in the Integrated Projects) has shown, the four Integrated Projects pose a very diverse set of ethical, legal, and social issues. Many of these currently apply to research, but a number of practical issues outside research can be foreseen and pose interesting challenges.

The **next step** will be to develop approaches and potential solutions to these issues. This will be the main aim of the final part of WinG4 for the 3<sup>rd</sup> deliverable: to put the relevant inputs and materials into an overall analytical framework in view of the vast variety of issues that have been documented so far; to relate these to the other WinGs (and especially the Roadmap, Landscape, forthcoming Industry Event, and Outreach with regard to Public Understanding of Presence Technologies); to make a realistic assessment and division between current, medium and long-term issues; and to provide an outlook for the relation between the development of Presence technologies and their social implications.

## **APPENDIX: INTERVIEWS CONDUCTED\***

<b>Name</b>	<b>Project</b>	<b>Location &amp; Date</b>
Prof. Mel Slater	Principal Investigator, PRESENCIA	PEACH Summer School, Dubrovnik, July 9, 2008
Dr. Rod McCall	IPCity	PEACH Summer School, Dubrovnik, July 10, 2008
Andreas Schweinberger	Manager, IMMERSANCE	PEACH Summer School, Dubrovnik, July 9, 2008
Prof. Miriam Reiner	IMMERSANCE	PEACH Summer School, Dubrovnik, July 11, 2008
Richard Walker	PASION	Telephone Interview, July 18, 2008
Joan Llobera	PhD Student, PRESENCIA	PEACH Summer School, Dubrovnik, July 9, 2008

\* In addition to these interviews, research for this part of the report also included extensive desk research, attendance at presentations, and informal discussions with project members.