Integrated Project on Interaction and Presence in Urban Environments

FP6-2004-IST-4-27571

ipcity.eu

Periodic Activity Report

Project Phase 2

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Abstract

The periodic activity report is submitted after each reporting period as defined by Article 6 of the contract (once per year for IPs). It is based on relevant information from Annex I of the contract.

This periodic activity report covers phase 2 of the IPCity project, i.e. the months 13-24. It consists of a publishable project executive summary, describes the main objectives of the project comparing them to the state of the art and summarizes the specific objectives, achievements and problems of the project within the first project phase individually for each work package as well as from a management point of view. If further high-lights other important project-related aspects and finishes with an overview of the recent dissemination activities.

1 Publishable Executive Summary

IPCity

Integrated Project on Interaction and Presence in Urban Environments

IPCity explores new technologies to enable interactive cross-media experiences in urban environments.

Mixed Reality technologies are used to enhance the user's real environment by virtual objects creating a highly dynamic interactive environment featuring more experimental and intuitive forms of interaction with digital information.

Application areas include but are not limited to urban planning, large-scale events, pervasive games, and digital storytelling.

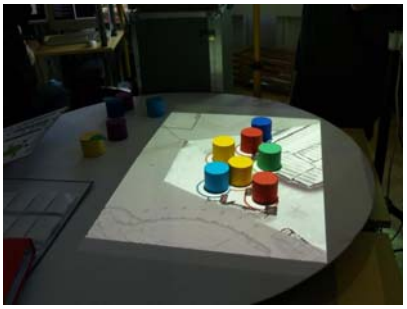
Research Activities

Cross-Reality Presence and Experience

The original contribution of IPCity to research on presence and interaction in mixed reality environments is that it studies the relationship between presence and user experience in real settings, focusing on how users actively construct and co-construct this experience through connecting activities in the digital/virtual space with activities in the real/physical environment. The main attention point is on users' purposeful activities in MR environments – how they collaborate, dynamically enact ('dramatic presence'), and map activities and events. The concept map and methodology we are devoping is shaped by insights from urban studies and grounded and evaluated in empirical studies in four showcases.

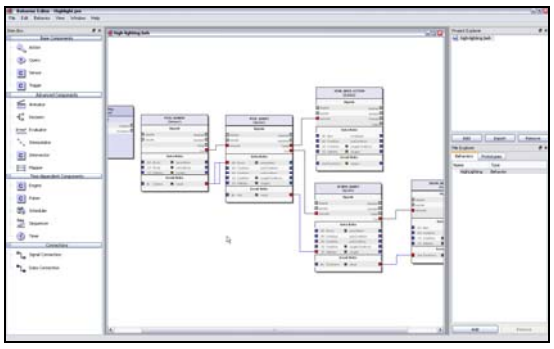
Cross-Reality Authoring and Interaction Tools

Mixed reality systems require a coherent development approach which encompasses tools to simplify technical development and those to support content creation. From a development perspective this area of work focuses on: cross-platform device access, platform independent user interfaces and interaction prototyping. Tools to support content creation are also being developed. In the second phase of the project we have started to work on ambient displays with multi-user interaction support.

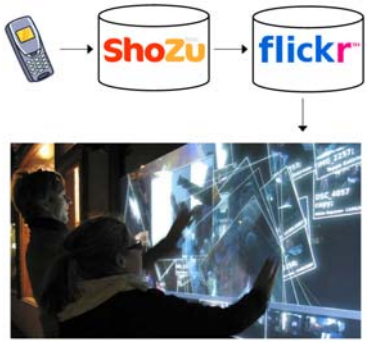


Exploring tangible user interfaces by the Color Table tool

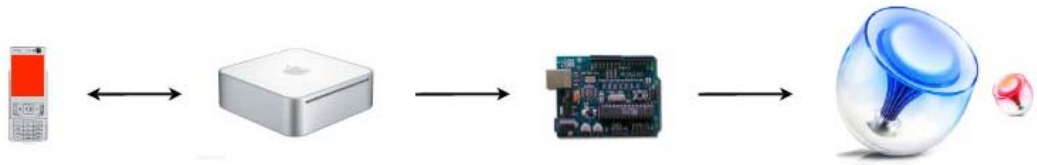
Orchestrating pervasive applications using the authoring and orchestration tool (AuthOr)



Visual programming environment for the Interaction Prototyping Tool



Multi-Touch Display

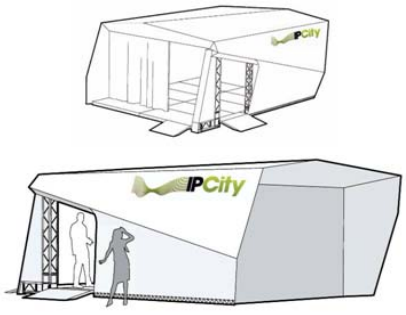


Illuminate : Information flow from mobile to lights via a Node and Arduino BoardNext Generation Mixed Reality Infrastructure

Next Generation Mixed Reality Infrastructure

Mixed reality (MR) infrastructure is focusing on basic research of mobile devices and their specifics to realize MR applications in urban environments. Mobile settings in this context can vary in scale between light-weight systems such as smart phones or sub-notebooks, and semi-stationary devices such as high-end equipment in the MR tent.

The work on infrastructure explores a range of issues including the suitability of different mobile devices, challenges in enabling AR on these devices, the creation of suitable MR content and the integration and fusion of available mobile tracking technologies.



Design of the MR tent environment

Tablet-PC based mobile MR system

Application Areas

Showcase 1: Urban Renewal

Mixed reality presents an ideal way for urban planners and architects to envision proposed changes on-site. Research in this work package focuses on developing technology prototypes that allow urban planning teams to create visual scenes and soundscapes, mesh these scenes with representations of the real environment, as well as debate, change, and annotate these configurations. This showcase will also explore the complexity of urban situations by working alongside real life urban renewal projects.

Urban Renewal Showcase: Collaborative creation of MR scenes

Showcase 2: Large Scale Events

Visitors to large scale events such as theatrical and musical performances or sporting occasions are usually only passive observers. The objective of this work package is to make them part of the experience, either through supporting communication with others or by allowing them to participate in the event itself. Permanent Installations and user-generated content ensure participants continue to engage with the works on an ongoing basis.

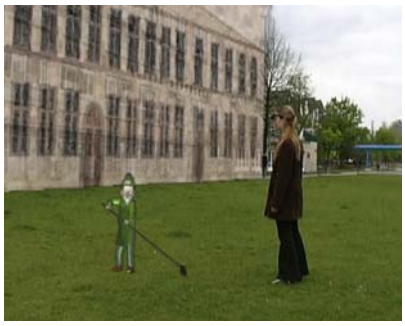
Large-scale Events Showcase demonstrators: F, MapLens, CityWall X 2, Illuminate

Showcase 3: TimeWarp

TimeWarp is an outdoor Mixed Reality game that allows the palyer to travel through time in the city of cologne. The story of the game is about some fictitious historical characters which are trapped in different time periods. The players have to rescue these little elves by solving challenges which are situated at different locations in the city. For this reason, each player is equipped with an AR system consisting of an optical see-through display, a backpacked laptop and several sensors and a handheld-based information system running on a pocket PC.

The little elve which has to be rescued

Player equipped with AR system



Player solving a challenge

Showcase 4: City Tales

The City Tales showcase focuses on the human-computer interaction aspects of presence and mixed reality, with the objective being to make MR accessible to non-technical users. Users will be able to create their own stories which will they can then share with others. Areas of interest include the use of haptics, web technologies and the creation of large scale for story sharing.

Location-aware mobile music-based City Tour (StreetBeat)

User Generated MR Tool, including creation and browsing elements and a conceptualization of MR Animation.

Further Information

IPCity is partially funded by the European Commission as part of the sixth framework (FP6-2004-IST-4-27571).

For further information regarding the IPCity project please visit the project web site at:
ipcity.eu

If you have any questions, do not hesitate to send an email to:
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Dissemination

As a result of project dissemination activities during 2007 two TV reports (German, Italy) and one radio report (Italy) have been published. Members of the project have participated and made presentations in 23 conferences and workshops around the world. Altogether 22 workshops, demonstrations and field trials together with showcase stakeholders and end-users have been conducted in the showcases. Two journal publications, 18 conference papers and 13 workshop papers and posters have been published. The main emphasis in publication during the year has been in forums for human computer interaction (HCI) and Mixed Reality. Based on a mixed-reality interaction innovation done in WP7, a spin-off company has been formed to exploit the idea commercially.

2 Project Objectives and Major Achievements during the Reporting Period

2.1 Overview of general project objectives and relation to state-of-the-art

2.1.1 Detailed scientific and technological objectives

Presence is essentially the feeling of being in a real or virtual environment, although research has also explored other media such a film, television and books. At its most broad level sense of presence is the feeling of "being somewhere", where that experience is real enough to give the person a true sense of being at a given location and possibly with others. As a result such a wide definition has encouraged a lively debate and consequently many different approaches being adopted.

The emergence of mixed reality interfaces, since the mid nineties, has opened up new areas of presence research. While virtual reality (VR) refers to the experience of users who are immersed in a virtual computer generated world, mixed reality attempts to mix virtuality (virtual objects or worlds) with the physical world. Researchers have considered a wide range of mixed reality interfaces, from augmented reality to augmented virtuality. Augmented reality (AR) can be implemented using a range of strategies, ranging from where the user´s view is augmented (e.g. with a see-through head-mounted display, HMD) or augmenting a physical object (e.g. embedding devices in physical objects), through to augmenting the physical environment surrounding, users and objects (e.g. by projecting images and record remotely). In general people associated mixed reality with the first approach, this naturally leads to a lack of understanding. However, augmented virtuality (AV) at the other end of the spectrum refers to augmenting a virtual world with information obtained from the real world (e.g. haptic interfaces etc.). Mixed reality interfaces represent a new area for presence research which will no doubt result in the emergence of new theories, measurement methods and applications. One of the central aspects of this new medium is the addition of virtual objects to real world environments.

The IPCity project intends to investigate mixed reality in real settings, i.e., away from laboratories and in real life situations, where the physical, social and cultural environment are constantly changing. This is achieved by focusing on challenging and original showcases that are based around urban life and social gatherings such as: large scale events, urban renewal, urban exploration ("time warp"), and city tales. These address, in distinctive ways various dimensions of presence that have surfaced in research e.g. physical presence (including immersion, engagement and involvement) and social presence (feeling of being present with others).

The approach within IPCity extends current research on presence and interaction in mixed reality with three types of contributions that are explained in this section: 1) new MR technologies and applications, 2) extending the understanding of presence and ways to support it (conceptual and instrumental contribution), 3) developing ways to investigate presence and experience for MR (methodological contribution).

Mixed reality technologies and applications. In order for MR technologies to evolve to a point where they can be used outside laboratories requires a number of objectives to be met:

- **An environment for MR interaction prototyping,** supporting easy creation and evaluation of new interaction mechanisms.
- **Achieving device abstraction and independency** through flexible and adaptable interfaces. A user interface description language allowing for platform and device independent user interface definitions.

- **Developing a platform and toolkit for cross reality content authoring**. Efficient and manageable tools for cross reality content creation accommodating different production models and workflows, (e.g. also tools for end user-content creation).
- **Configurable infrastructures** covering the widest range from wearable equipment to tangible computing environments. Supporting real life situations with a wide choice of MR tools from head worn displays to tangible environments to support group work.
- **Semi-stationary outdoor mixed reality environment**. We envision a semi-stationary (or semi-portable) structure for outdoor use, that exploits the features of the surrounding physical environment.

Conceptual and instrumental contributions. The original contribution of IPCity to research on presence and interaction is that it studies the relationship between presence and user experience in real settings, focusing on how users actively construct and co-construct this experience through connecting activities in the digital/virtual space with activities in the real/physical environment. The main attention point is on users' purposeful activities in MR environments – how they collaborate, dynamically enact ('dramatic presence'), and map activities and events.

Our particular conceptual attention points are also shaped by insights from urban studies on salient features of the material environment that contribute to the experience of presence on the one hand, are resources for constructing and co-constructing this experience on the other hand:

- *Spatial aspects* - MR technologies can be used for changing the scale of virtual objects, hence immersiveness, for making invisible objects (borders, archaeology, infrastructure) visible;
- *Temporal aspects* - such as for example making traces of the past visible, envisioning future development or the evolution of an event;
- *Mobility* - urban rhythms play a large role in experiencing a city, such as differences between day and night as well as flow and movement (of people, traffic);
- *Ambience* – includes all forms of sensations and imaginations about the environment surrounding the person resulting in a ‚sense of place and culture';
- *Material aspects* - contribute to the *engaging* the capacity of objects to absorb people's attention, thereby increasing their engagement with each other and the world and they are sources of 'reality' and 'haptic directness'.
- MR technologies and the focus on user activity and experience also require to extend our understanding of how these are supported by interface mechanisms. Our hypothesis is that virtual components modify the experience of the 'here and now' in subtle ways rather than altering it radically. Our main aim is to find out how technologies can be used to support interesting and relevant modifications of the 'here and now'. This necessitates a redefinition of the concept of directness, immersion, and reality on the one hand. It directs attention to:
- *Awareness cues* – cues about social interactions, communication, and activity in an MR environment;
- *Content* – used for building a visual scene or for story-telling can be informative, expressive, based on rules and constraints and is crucial for the experience of presence;

Multimodality – involving all the senses through dynamic representations, the inclusion of sound, and particular representational techniques (fuzziness, abstraction).

Methodological contribution. IPCity develops an approach to investigating presence in real life settings which combines common methods like presence questionnaires with techniques for use in the field such as: participatory workshops, ethnographic observation, interaction analysis, and usablity tests. Qualitative and quantitative methods will be integrated to account for cognitive and socio-cultural aspects in particular combining:

- spatial and social presence questionnaires , with the emphasis on understanding aspects which relate to mixed reality and how this can be used to inform the design process
- interaction analysis based on video recordings and interface interaction logs
- mobile experiments which may use methods such as video recording, in-situ interviews etc, in order to understand more about the experience of end users.
- Interviews examining specific areas as defined by prior findings e.g. technical issues or to explore wider aspects of place and presence.

2.1.2 Comparison to the state-of-the-art in MR technologies

Mixed Reality aims at enhancing a user's perception of the real world combining mobile computing using wearable computer set-ups, MR can create a 3D information space that lives around the user. The main technological aim of IPCity is to move high-quality MR a step further from labs to real settings. This requires innovation at several levels and therefore going beyond the state of the art:

- Development environments as reliable and efficient toolkits for prototyping applications are missing and needed to develop and test in short time frames diverse applications,
- Authoring environments as cross reality content production environments have not yet been addressed and need to support advanced features as device independence and different production models
- Infrastructures and platforms need to support a wide range of mixed reality approaches from wearable to semi-stationary environments.

Mobile AR is typically implemented using wearable computers, head mounted displays, resulting in heavy and complicated equipment. Moreover, the capacity and quality of such systems is limited by the performance of wearable computers and the infrastructure that is available outdoors or in a mobile setting. For example, high quality tracking is normally unavailable outdoors, since commercial systems require AC power and are stationary. Moreover, previous research systems for mobile AR have only used rudimentary collaboration features for fully mobile users, since it is significantly more difficult to build collaborative applications if no assumptions can be made about location, size, and other parameters of the user group.

We envision to build high quality collaborative mixed reality systems as portable (not only wearable) environments for small groups to larger communities. The systems will diverse approaches to AR (not only head mounted displays) providing also embodied interaction and tangible interfaces. It will also rely on projection based AR for unencumbered access to the system for a rapidly changing user groups. To our knowledge, our notion of semi-stationary environments (for example a MR-Tent) is the first attempt to build a portable MR system. It is a carefully designed compromise between quality and mobility. Also the idea of building a semi-permanent structure to house the technology that can be set up, used and disassembled within a day has not been explored by previous work. All systems documented in the literature either aim at single-user fully wearable solutions, or stationary high quality environments.

There is some existing work (for example, in the MIT tangible media group) on AR or tangible interfaces for architectural design. The recently concluded ATELIER IST project, in which some of the consortium members participated, while experimenting with such interfaces in support of architectural design, did not explore 3D AR or mobile computing directly. The ARTHUR IST project implements 3D AR for architecture and urban planning but is limited to a round table scenario. The 3DMURALE IST and ARCHEOGUIDE IST projects use augmented reality for reconstruction and presentation of ancient architecture in Europe. While our project is also grounded in the long tradition of architecture and archaeological reconstruction, this tradition - unlike urban renewal - does not require interactive modification of the presented artifacts.

We will also investigate the participation of mobile AR users and the possibilities of connecting their activities to those in the semi-stationary environments. The mobile users we envision will either be specialist "scouts" with high-end mobile AR equipment providing mobility in the surroundings, or ordinary citizens, using low-end devices primarily for informal browsing and interaction. Both types of interaction are technologically relatively new approaches, and have not been used in the context of architectural design. The MARS project carried out by the computer science department at Columbia University investigates collaborative user interfaces for indoor and outdoor AR, but is mainly focused on text-based annotations and does not allow for a sophisticated visualization of construction plans. The *Tinmith-Metro* project at the Wearable Computer Laboratory, University of South Australia, allows viewing and construction of 3D graphical models in an outdoor environment but relies on a single high-end user interface. The types of user interfaces and interactions in IPCity will thus be subject of novel research.

Furthermore, we will develop important enabling technology for MR, in particular displays and tracking methods. Several prototypes of light weight HMDs will be developed and evaluated during the project. More robust tracking will be developed by fusing several complementary technologies and further developing selected technologies – mainly computer vision based methods.

Handheld devices seem to be a superior alternative for AR - especially for untrained users in unconstrained and non-supervised environments. They are more robust than HMDs and due to the advent of mobile phones and PDAs users are comfortable operating them. Even before the success of the smartphones as mass-marketed items, pioneering projects started using small displays for custom see-through devices. Amselem’s work 0 and Fitzmaurice’s Chameleon 0 used small tethered LCD displays for location based information. Rekimoto’s NaviCam 0 used color-coded stickers to track objects in the environment. Due to the tethered trackers in these early works, the degree of mobility was rather limited. mPARD 0 is a variant using analogue wireless video transmission to replace tethers.

The Transvision 0 project by Sony CSL introduced handheld AR devices for a shared space. Researchers at HITLab later improved this concept 0 with a better user interface and an optical tracking solution re-using the camera needed for video see-through.

From 2000 on, PDAs with wireless networking were considered suitable for thin-client solutions outsourcing computationally intensive tasks such as rendering, tracking and application to a nearby workstation. The Batportal 0 used non-mixed 3D graphics using VNC, while the AR-PDA project 0 used digital image streaming from and to an application server. Shibata’s work 0 aims at load balancing between client and server - the weaker the client, the more tasks are outsourced to a server. ULTRA uses PDA for augmenting “snapshot” still images 0.

In 2003 Wagner ported ARToolKit 0 to Windows CE and consequently developed the first fully self-contained PDA AR application 0. This platform was used in a peer to peer game in 0. Meanwhile Möhring et al. targeted a Symbian smartphone for mobile AR 0. The scarce processing power of the target platform allowed only a very coarse estimation of the object’s pose on the screen. Later Henrysson ported ARToolKit to the Symbian platform and created

a two-player AR game 0 on current-generation smartphones. Several of these projects involve collaborative applications, but not for larger users group.

We are not aware of any alternative solutions that work in both daylight and nighttime, and achieve the same performance as our implementation. Technologies from Apple and Microsoft provide similar tools with the difference that the first is not on such a moveable scale (from small to large) and is affected by light, and the second does not integrate already existing technologies, such as yahoo search, twitter, IM, google maps to name a few.

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2.1.3 Comparison to the state-of-the-art in multi-touch display

The main features of the CityWall technology are 1) multiple hand tracking capable of identifying uniquely as many fingers and hands as can fit in the screen, 2) hand posture and gesture tracking, 3) high resolution and high frequency camera processing up to 60 frames per second, and 4) computer vision based tracking that works in changing light conditions. The main challenge was to support interactions for any user, from a child to a senior citizen, not requiring special skills or previous knowledge. The four technological features create the conditions for such a multi-user and multi-touch installation that is appropriate for public space. The set up is similar to HoloWall (Matshushita et al. 2003). This setup allows us to place all the equipment indoors out of the public space and use a normal safety glass as a screen.

CityWall is especially suitable for navigation of media, photos in particular. The current version gathers content that is tagged with certain keywords It is navigated by scrubbing it left or right and it can also be compressed or expanded to show the contents retrieved during a full day or just during a couple of minutes. This has been found important as the frequency of media may vary greatly.

Interaction with CityWall follows two interaction paradigms. Moving, scaling and rotation of content follows direct manipulation principles: the user can grab an image by putting a hand on it. The photo follows the hand movements when the user shifts her hand. Rotation and scaling are possible by grabbing the photo in more than two points (e.g., by two hands or two fingers of the same hand) and then either rotating the two points around each other or altering their distance.

The other interaction principle is non-modality. All the functionalities mentioned above are available for the user all the time. This is in contrast to modal user interfaces in which different modes of interaction are often chosen from palettes or menus. Non-modality is especially important for multi-user systems because confusions arise easily if the system needs to associate different touches with different interaction modes. With non-modal interaction this problem does not occur.

To facilitate easy media capture and sharing, a mobile component was also designed. The mobile component includes a camera phone that includes software to upload pictures to the instantly after a photo has been taken. For this purpose we used the publicly available ShoZu application. The CityWall computer in turn periodically checks for new content and downloads it to the wall. With this arrangement, users can take pictures easily with their camera phones during an event and later view them also on the CityWall. The pictures are also available for viewing on the Internet, which gave the users more benefit (and motivation) for publishing photos.

In this state of the art we especially concentrate on public display as this is the component of the demonstrator that has been most significantly further developed in this period. Public outdoor spaces in urban environments are an interesting but under-researched setting for large multi-touch screens. Reported user studies have been carried out in laboratory settings or in semi-public indoors contexts such as offices and conferences. Social organization of the public space is however different from private settings (like companies) and semi-public settings like conferences. These three settings differ in a number of dimensions that may or may not affect interaction, such as number of potential users, social relationships between potential users, and knowledge about the display and its use.

Reference:

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2.1.4 Comparison to the state-of-the-art in presence research

Presence research focuses on the dimension of subjective perception, analyzing the ways in which an individual's experiencing is mediated by technology, distinguishing between “first order mediated experience” (when experience is mediated only by the human senses) and "second order" mediated experience (when experience is also mediated through technologies). Presence as a second order mediated experience has been articulated in a variety of dimensions: spatial presence or presence in a physical space (e.g. perceptual immersion, sense of being there), sensory presence (perceptual realism), engagement (involvement) and social presence (including co-presence). Presence research has considered primarily traditional media as mediating systems. In Presence I, projects have focused on virtual reality, 3D imaging, haptics and robotics. The MEC project: Measurement, Effects, Conditions IST-2001-37661 investigated the role of presence experiences in media-based learning processes with regard to educational hyper text and VR/multimedia systems. In the project POEMS (Perceptually Oriented Ego — Motion Simulation), a VR set-up is explored that allows for convincing simulation of ego-motions without actually moving the observer, by combining auditory, visual, and vibrational cues. Other projects aimed at enhancing virtual environments with novel camera technologies to achieve a system that displays photo-realistic 3D images, one example includes BENOGO, Being There - Without Going IST-2001-39184. TDIS IST-2001-38862 investigated a Three-Dimensional Imaging System based on integral photography for precise simulation of 3d perception and enhancement of the telepresence effect (TDIS). Presence I projects have also addressed haptics and robotics. For example Touch-Hapsys - Towards a Touching Presence, investigated haptic and multimodal illusions to realize presence through perceptual tricks allowing circumvention of current limitations in haptic actuator technology. With an artificial intelligence approach, ADAPT IST 2001-37173 was aimed at realizing an artificial system capable of building internal representations. With another take on robotics the IST-2001-38873 project PELOTE investigated the teleoperations of Mobile Robots. PeLote proposed a system for teleoperation, where the operator is a human supervising many remote entities from a distance and the entities are working in cooperation in the same environment.

Within the presence community there is a growing criticism of mainstream presence research. Mantovani and Riva (1999) suggest that Gibson’s ecological theory of perception would offer a better starting point than the mainstream position presented above. In Gibson’s (e.g. 1971) view valid perception is that which allows affordances that make successful actions possible in the environment, and this perception can vary from one person to another and from one moment to next, depending on what actions one needs to initiate. If we accept Gibsonian view, there is no fundamental difference between ‘real’ and ‘artificial’ environment – both of them are mediated, we do not perceive either of the ‘as such’ but always filtered through the purpose of our actions where we are engaged. Based on this perspective, there is a lively debate on cultural and social aspects of presence (e.g. Spagnolli and Gamberini 2005), on users’ agency (O’Neill 2005), ‘dramatic presence (Dow et al. 2007), and on the role of the physical environment of space and material resources.

Recent advances in mixed reality interfaces call for widening the focus on the mediating systems beyond virtual reality, or the narrow focus of haptics and robotics, towards a multimodal and mixed media approach. As mixed reality environments move nearer to real world settings this provides opportunities to further develop the concept of presence. The ‘mixing’ of aspects of the immediate surrounding (physical environment) with technological augmentations opens up new forms and experiences of presence. Most of the past “telepresence” research studied the effects of traditional media, teleconferencing systems and virtual environments and application areas such as telemedicine, training, teleconferencing, entertainment (multi player games, MUD etc.). A variety of application areas and emerging technologies remains unexplored. Mixed reality allows users to change and actively shape the configurations of real and virtual layers into an experience – mixing places, (historical) times, staging events, changing social formations and identities. IPCity

focuses on novel application areas around urban life and social gathering: large scale events, urban renewal, urban exploration (time warp, city tales). The scenarios developed for these showcases address in distinctive ways the various dimensions of presence indicating novel aspects to be considered, among them:

- the role of users' purposeful activities in achieving presence and the perfornative and expressive aspects of these activities,
- understanding user experience through creating and interweaving events in the real world with the virtual and imagined,
- augmenting presence by giving access to hidden or invisible aspects of a place,
- supporting the perception of an event that is distributed in an area and that is partly (at times) collocated and partly (at times) moderately remote,
- working with temporality – paths, change, the sequence of events,
- understanding the role of materiality/tangible objects in the construction of presence,
- investigating mobility as a specific research issue for urban interfaces
- using MR as interventions in an urban environments. .

IPCity moves beyond the state of the art of presence research also in respect to methodology. Most of the research in presence has been carried out in laboratory settings. Field trials in real setting are new to presence research as also mobile and public applications. This requires devising a new triangulation of research methods combining common methods like presence questionnaires with methods for use in the field such as: participatory workshops, ethnographic observation, quasi experiments, and interaction analysis. Qualitative and quantitative methods will be integrated to account for cognitive and socio-cultural aspects.

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2.2 Recommendations from previous reviews and take-up measurements

This sub-sections provides a summary of the recommendations from the year 1 review and a brief description of the the take-up measurements of the consortium.

Overall assessment

- A need to exhibit a shared vision was identified. A closer integration of WP3 with all showcase work packages was requested.

  - Project management has significantly enhanced the role and resources of the presence work passage in order to achieve this shared vision. As there was already a pretty close integration between WP3 and the first two showcases, it was ensured, that this was also extended to the remaining ones. Beside a more strict enforcement of the cooperation between the showcases and WP3, this was also achieved by having a presence expert joining the consortium staff.

- A clearer evaluation and means for measuring success was requested.
  - The whole evaluation process and measuring process was re-defined as described in the revised deliverable D1.2
- The project should be more ambitious (in all aspects).
  - Within the re-design phase we identified for each WP the individual objectives for the current year determining specific state-of-the-art goals.
- The project should have a more consistent framework in the development of technology.
  - All general technologies are developed in WP4 and WP5. The overall framework for the development of those technologies was specified in more details at the beginning of phase 2. A description may be found in the corresponding deliverables of the above WPs.

Work plan

- The project should attempt to be more ambitious rather than continuing with incremental improvements.
  - See above.
- The project's Scientific Board should work to ensure that all of the work package subprojects are relevant to the focus of presence and mixed reality.
  - While the vast majority of all activities was already directly related to presence and mixed reality in year 1, it is true that some activities did not focus on those. Those were re-directed after the review to ensure they contribute to the overall project objectives.
- There should be more focus on dissemination
  - The overall dissemination activities were increased significantly. This was due to several reasons. First, there were much more results available in year 2 to be disseminated. Second, in the revised version of the deliverable D1.2 there were clear goals for publications and presentations even on a sub-work package level. All those goals have been achieved for year 2. Third, due to the better integration (e.g. through PEACH) dissemination also occurred on various other levels (e.g. PEACH summer school, Presence conference panel, etc.)
- The Scientific Board should ensure the personal privacy ethics are considered and how potential concerns from the public may be addressed.
  - The SB board seems no immediate problem with ethical issues. All test subjects gave informed consent to their participation throughout the trials. In the limited, supervised trials conducted so far, sensitive issues were typically not touched. However, the SB suggests to WP leaders that in Year 3, when conducting larger, potentially unsupervised trials or trials with unknown users (such as in freely accessible public installations), care must be taken with respecting matters of privacy. Every freely accessible trial must contain a

disclaimer if automated or manual recording or supervision is performed for scientific purposes.

Deliverables

- The reviewers requested the deliverables D1.2, D1.5, D3.2, D6.1, D7.1, D8.1, and D9.1 to be revised.
    - All those deliverables were revised according to the individual requests and submitted in time to the EC.

A detailed response to the recommendations of the previous review as submitted with the revised deliverables in May 2007 is attached as appendix to this deliverable.

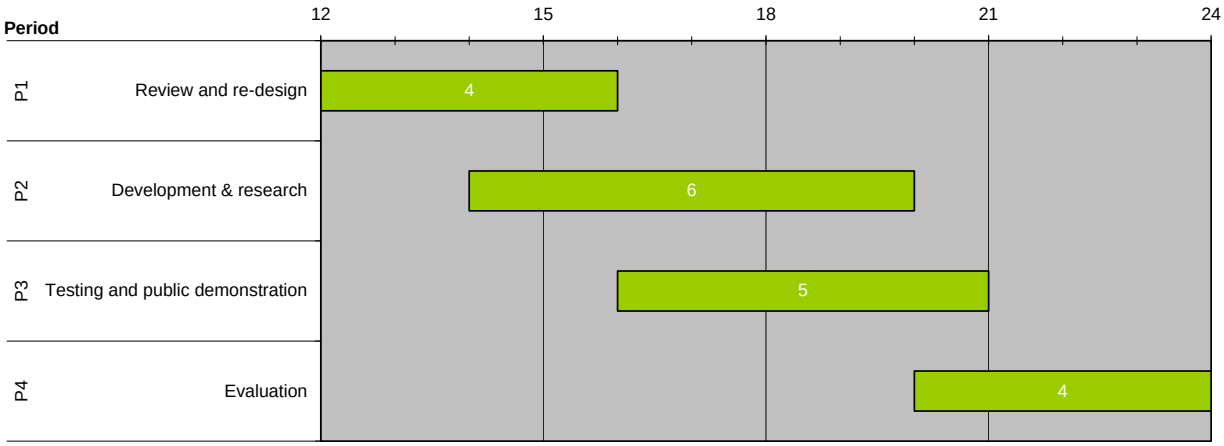
2.3 Objectives of the reporting period and main achievements

The general objective for the second 12 months of the project was to modify and improve the research and development based on the feedback and initial evaluation of the early demonstrators realized in year 1 of the project. Our principle approach – using a set of sample applications (the showcases), which are organized as sub-projects and aim to design and develop selected applications within different areas of overall project theme – had proven to be useful for the overall project as it allowed us to experiment in these areas to gain a better understanding of the needs and wishes of citizens, resulting in better overall project results.

In project phase 2, first prototypes of the services, tools and infrastructure components developed within the research work packages were provided to the showcases, where they were tested and evaluated. Feedback was given to the research work packages, which will revise their work plan and adapt or re-design their prototypes accordingly. However, for particular research activities (e.g. interaction prototyping or computer vision based marker-less tracking), research and development had to be continued in phase 2 before they could be applied to the showcase applications. Those development will be deployed to the showcases in year 3.

In general we sub-divided the month 12-24 into the following periods:

- The analysis and re-design period (13-16, depending on WP)
- The development period (month 15-20, depending on WP)
- The testing and public demonstration period (months 17-21, depending on WP)
- The evaluation period (months 21-24)



The analysis period following the initial tests provided the necessary feedback to the individual showcases and research work packages for the re-design of their prototypes. Similar to the initial requirement phase in year 1, the re-design was based on requirements relevant for particular showcases on one hand and those applying to several showcases and therefore addressed by one of the research work packages on the other hand. The research work packages re-defined the set of tools, services, and infrastructure components to be used by the showcases. Based on the requirements from the showcases the time-line priorities for their development were updated.

The subsequent development phase considered the re-design and adapted and extended the prototypes according to the needs of the showcase applications. Additionally, new prototypes were developed (e.g. WP9) or prototypes not already started in year 1 of the project were realized (e.g. WP8).

The development phase was followed by a testing period. In the testing and evaluation phases the showcases evaluated their developments as field tests or public demonstrations providing the necessary feedback from outside the consortium for the year 2 evaluation. The research results from the showcases were evaluated by the research work packages to foster bidirectional integration about all work packages. The research work packages further provided trainings on tools and infrastructure components where appropriate.

In preparation of the forthcoming year project review the results of the individual showcases were reviewed. The project's Scientific Board reviewed the showcases and proposed changes to the overall showcase structure and topics were appropriate. Within the research work packages, the results and the future plans were reviewed based on the feedback received from the showcases as well as regarding new general trends and developments in the area of interactive mixed reality environments and presence, which have to be addressed or considered by the project. Based on these reviews the individual work plans for the work packages were adapted or extended.

In detail the main achievements of period 2 of the project were:

- The strengthening of the consortium by an additional partner providing an expertise in the area of augmented maps and geometry-based computer vision for user localization.
- The establishment of more elaborated mechanisms for measuring the overall impact of the project including a strict monitoring of the quantity and quality of publications and other dissemination activities.
- The successful integration of the project in other MR and presence related activities on the European level, including but not limited to the close cooperation with other project such as PEACH, PRESENCCIA, IPerG, PASION, CoSPACES, etc. and contributions to appropriate events (e.g. PEACH summer school, EC computer-human confluence workshop).
- Getting the dissemination outwards from the project well established. This includes scientific publication activities and communication with both relevant scientific communities and external stakeholders.
- Further consolidation of the conceptual framework for presence and interaction. Joint analysis of field trial materials has confirmed the aim to place our emphasis on presence and user experience, on users actively creating connections between physical and digital spaces and how this is supported by IPCity technologies, as well as on the relationships between ‚existing' and ‚imagined' spaces. The concept map guiding research on presence and interaction has been further developed and enriched so as to capture all relevant aspects. Research on sound has confirmed its relevance for presence research and concepts for working with sound have been developed.

- Work package 4 has adapted, redesigned and/or improved six technologies from year 1 based on the feedback of the showcase and internal developer meetings, including AuthOr, ColorTable and OpenVideo, additionally we started three new technologies, namely the Multi-Touch Display, the Mobile Media Collector and the Location Based Media Browsing on Paper Maps. Especially the Multi-Touch Display is an outstanding technology, which already resulted in a spin-off and a patent application. Most of the technologies developed are already part of the showcase applications.
- Based on feedback of the showcases and internal developer meetings, the work on Mixed Reality infrastructure components has adapted, redesigned and improved ten different technologies from phase 1, including Vision Based Localization, HMDB Interfaces and the MR-Tent. Additionally three new technologies were introduced, namely the Augmented Map Table, Illuminate and Spatial Sound. Contributions where made to all the four major building blocks: Tracking, Computation, Storage and Mobile AR. All of the technologies developed are part of the showcase applications.
- Further development of the initial urban renewal application demonstrator. The Urban Renewal prototypes were successfully further developed, enriched with additional functionalities as well as re-designed so as to better support collaborative activities and simplify interactions. Central issues of representation were addressed as well as the needs of different types of urban renewal projects. An additional *ColorTable* prototype in support of working with rules was developed and tested. Advanced scenarios of use were developed.
- WP7 has created a new version of the large-scale demonstrators and carried out a new round of field trials. The current demonstrators follow the plan of having a mobile, an installation and a pervasive component. In all components substantial advancement has been made. As the mobile component CoMedia was already field trialed in year 1, WP7 shifted it's focus to investigate the augmented map lens as a new mobile component. The installation component has concretized in the CityWall that is a large multi-touch display setup as a permanent installation in Helsinki city center. The CityWall has been the object of extensive field trials. Finally some prototype development has happened around Illuminate, the pervasive component, which finally had a first prototype version. The Illuminate component has also now a working prototype and while the concept has been developed further towards an ambient guiding system, a new concept for navigating the urban space has been created: the idea of the mobile MapLens application is to augment real maps with location based and user created media
- The realization of the first TimeWarp application as a single user game. This included two systems – the mobile AR system and the handheld-based mobile information system. Furthermore evaluation techniques were developed and applied during the test runs conducted to explore issues related to the game play and presence.
- WP9 main achievements included elaborate user test and evaluation of the StreetBeat application which lead to findings that where published at "CHI" and a "Peach" newsletter. In adition a conzeptualization of 3D characters within a MR application based on the 12 principles of animation of Walt Disney was developed, This work will be published as the poster "12 MR principles of animation" at CHI2008. Finally City Tales created a new porototype "Leo's Adventures" wich is an online MR user generated content tool that is based on the 12 MR pinciples of animation and allows any web user to create MR content using any video material using peer studies and 3D expert analysis during the conzeptualitzation phase and prototype development.

2.4 Most important problems and corrective actions undertaken

A couple of measures were applied in response to last years review report (see sub-section 2.2 above and attached appendix). Beside those,

In order to strengthen the cross-work package cooperation resources were adapted according to the plan presented at the year 1 review. This included increased resources for WP3 Presence and Experience as well as further adjustments for making WP6 and WP7 research issues available to all consortium participants.

Further, as foreseen by the description of work and also already presented at the year 1 review, a competitive call was launched in order to add specific competences in the areas of augmented maps and geometry-based computer vision tracking to the consortium. Please see Section 5 on details regarding the accomplishment of the call for partners.

Both above changes became part of the second amendment to the contract.

Another major problem which arised during the second year of the project was the organizational change from SNS to SONY (see section 4.1 for details). The implications of this step were discussed in several Scientific Board and Management Board sessions and finally lead to the decision to ask SONY to leave the consortium and a new partner to be asked to join. Based on the votes by the Management Board SONY will leave the consortium after month 26 (i.e. immediately after the year 2 review) and the new partner Imagination (IMAG) will join the consortium in month 25. The new partner will also take over the responsibility for one showcase.

According to the description of work, showcases can be stopped after each full year of the project and new or joined showcases may be established based on the recommendations of the Scientific Board. Due to the exit of SONY and joining of the new partner IMAG the Scientific Board recommended to finish the current WP9 City Tales showcase and to start a new showcase in the same overall thematic area with the new partner. While this is actually a new application showcase realizing a different application and using different technologies, the overall goal of the City Tales showcase was considered to be very important for the project. However, it was emphasized that the new City Tales showcase should focus much more on Mixed Reality aspects (this is also in line with the specific recommendations from the reviewers regarding this work package).

Further, problems regarding the manufacturing of the MR tent occurred due to the fact that the original design approach was not feasible within the scope of the project. As the MR-tent was considered to be a core technology of the project, it was decided to come up with a re-designed tent even if this implies further delays regarding its availability. The re-design came along with additional costs of approximately 30k€. It was requested and approved by the Management Board to take this money from the reserved money as not already needed for new partners and to distribute 10k€ to TUW, TUG and UniAK each for this purpose. This transfer was approved by the Management Board and will be part of the 3rd amendment to the contract (subject to approval by the EC).

As presented in the year 1 review and described in last year's periodic activity report, it was anticipated to extend the IPCity consortium by HITLAB NZ on a co-funded basis (not requiring any funding to be transferred to NZ). This however, turned out not to be possible from the NZ side, whereas the transfer of any EC money to HITLAB would have required another competitive call first, which was not anticipated by the IPCity consortium. Thus, it was agreed to cooperate on a less formal level and to make the extraordinary scientific reputation of HITLAB NZ available to IPCity by sending researchers to NZ for training. An overall budget of up to 50k€ from the reserved money was set aside for this purpose in order to cover travel costs to HITLAB NZ for travels between 1 and 3 months. This transfer was

approved by the Management Board and will be part of the 3rd amendment to the contract (subject to approval by the EC).

3 Workpackage Progress of the Period

This section provides an overview of the actions carried out in the reporting period, based on the workpackages which were active or planned to be active during the period.

For each workpackage, the following information is presented:

- Workpackage objectives and starting point of work at beginning of reporting period
- Progress towards objectives – tasks worked on and achievements made with reference to planned objectives, identify contractors involved
- Deviations from the project work program, and corrective actions taken/suggested: identify the nature and the reason for the problem, identify contractors involved
- List of deliverables, including due date and actual/foreseen submission date

3.1 WP 2 – Dissemination

3.1.1 Objectives and starting point of work

The overall objective of this work package is to ensure maximum dissemination and impact for the results achieved during the project both internally within the project and externally in relation to the scientific community, other stakeholder and information society in general.

During the first year the main objective of this WP for the first year was to establish internal communication channels and practices. During this year the main objective has been to get external scientific and stakeholder communication up and running, and to ensure efficient and smooth communication and operation within the project

3.1.2 Progress towards objectives

The dissemination strategy has been updated and accepted as an annex to the project handbook (D2.4). Together with the project handbook the dissemination strategy defines communication channels, practices and responsibilities for dissemination activities.

The communication channels and tools developed during the first project year have been in steady use in the project:

- A central document repository (BSCW, administered by FIT) has been intensively in use during the project, and it is a central resource to the project.
- A number of official e-mail distribution lists (general, one for each board, one for each larger work package). The messages sent to these lists are also archived in the BSCW. Besides the official lists, there is a lot of e-mail traffic between individual memebers and ad-hoc groups. The volume of e-mail traffic within the project can be characterized by a personal-level example: the leader of the WP2 received during 2007 about 1100 project-related e-mail messages, 20% more than in the previous year.
- A public website for external and internal distribution (www.ipcity.eu), updated when new information has become available. The website has had 22740 page views by 16666 unique visitors during 2007.
- An electronic newsletter was published 7 times during the year, containing altogether 91 news items. It was distributed by e-mail inside the project and made available also through the project web site, where it had 561 unique visitors through the year.
- A wikipedia-type common glossary for the project (part of the website, although technically a separate site)

- A software repository for exchange of program codes (part of the BSCW)

Two project-level workshops have been held to discuss about dissemination issues, the first in the general meeting in Helsinki in May, and the second during the general meeting in Paris in October. Based on the discussions at the Paris meeting, a number of improvements in communication issues was made, including a major update of the web site.

The following dissemination materials and templates that were created to help partners in their dissemination activities in the first year have been in use:

- A project report template
- A project logo
- A project poster (A0-A3), currently being updated
- A project brochure (A4 folded), currently being updated
- Two sets of Powerpoint slideshow templates
- An animated project logo for project videos

IPCity has participated in the PEACH summer school at Santorini in July 2007 and the Presence conference at Barcelona in November 2007.

3.1.3 Deviations from project work program

No major deviations from the original work program have occurred.

3.1.4 List of deliverables

Del. no.	Deliverable name	Date due	Actual / Forecast delivery date	Estimated indicative person-months *)	Used indicative person-months *)	Lead con-tractor
D2.4	Updated dissemination strategy and knowledge management plan for phase 2	M17	M18			UOulu
D2.5	Report on dissemination, visibility and training activities during Phase 2	M24	M25			UOulu

*) if available

3.1.5 List of milestones

Milestone no.	Milestone name	Date due	Actual/Forecast delivery date	Lead contractor
M2.4	Knowledge management plan and dissemination strategy updated for phase 2	M17	M18	UOulu
M2.6	Report of the dissemination activities ready	M24	M25	UOulu

3.2 WP 3 – Cross-Reality Presence and Experience

3.2.1 Objectives and starting point of work

The overall objectives of this work package are

- to analyze experiences from field trials and presence questionnaires in the four showcases, achieving a deeper understanding of how mixed reality environments influence the experience of presence and how this enables novel forms of social interaction, of exploration and understanding

- to define a conceptual framework in support of designing 'technologies of presence' that inform the design of interface mechanisms in support of presence within the project and guide the integration of these technologies into real world settings.

For the first second year of the project we had set ourselves several goals:

- To define a set of multiple methods appropriate for triangulation in data collection on presence and interaction in MR environments
- To analyze data from field trials in the four showcases, achieving a deeper understanding of how mixed reality environments influence the experience of presence and how this enables novel forms of social interaction, of exploration and understanding
- To use data from the field trials to evaluate and improve the conceptual framework developed in Phase I.

3.2.2 Progress towards objectives

Within the framework of WP3 major research activities have been undertaken:

- All four showcases carried out field trials, according to the agreed upon evaluation approach (described in the revised version of D3.2). The results of these field trials regarding presence and interaction in mixed-reality environments were discussed in a two days working meeting in Vienna, Nov 29-30, 2007;
- The state-of-the-art of research on presence and interaction in mixed-reality environments has been reviewed and extended;
- Approaches within architecture and urban planning relevant to the study of presence and interaction have been analyzed;

Research into sound and presence has been undertaken, with first results on how to make use of sound in showcases WP6 and WP8.

In the working meeting in Vienna all showcases presented their research on presence and interaction using the initial concept map, which proved useful. However, also a series of suggestions was made how to improve the conceptual framework. We decided to place our emphasis on presence and user experience, on users actively creating connections between physical and digital spaces and how this is supported by IPCity technologies, as well as on the relationships between ‚existing' and ‚imagined' spaces.

An important additional perspective to be integrated in the concept map is the urban planner's view, with the notion of ‚the project' as mixed-reality, the approach to designing for experience, as well as intervention as an urban strategy. A new research topic to be integrated with the concept map is the use of sound.

The results of this joint development are described in detail in D3.3.

The agreed upon evaluation framework was followed in all four showcases. It was felt that WP3 should accentuate the different approaches in each showcase – from interventions in an urban environment to more playful forms of engagement – since our experience is that this enriches our perspectives on presence and interaction.

Joint analysis helped all showcases to rethink and better focus their research questions. The focal point common to all is to understand users' interweaving and connecting of the real world and events in it with the constructed ‚virtual' world, be it a game experience, interactions on a multi-touch screen, or the imagining and experiencing of changes to a real place. Also we managed to identify more concrete themes across showcases to better ground a IPCity vision of what to design for see D3.3.

We successfully organized a Panel at Presence2007 [1] where we presented the unique IPCity approach and debated with invited discussants about challenging the traditional view on Presence. The outcome has been an important milostone for IPcity to confront with this community however the next steps are to impact bigger and diverse research communities (CHI, CSCW, etc.)

In addition we successfully published one conference paper and a journal paper has been submitted (Jacucci and Wagner Performative Roles of Materiality for Collective Creativity, Leonardo Journal).

3.2.3 Deviations from project work program

None

3.2.4 List of deliverables

Del. no.	Deliverable name	Date due	Actual / Forecast delivery date	Estimated indicative person-months *)	Used indicative person-months *)	Lead con-tractor
D3.3	Improved conceptual framework, research findings from all four showcases regarding presence issues, and guidelines for interface design	M24	M25			TUW

*) if available

3.2.5 List of milestones

Milestone no.	Milestone name	Date due	Actual/Forecast delivery date	Lead contractor
M3.4	Conceptual framework improved and evaluation plan consolidated	M24	M24	TUW
M3.5	Research findings, and guidelines for interface design	M24	M24	TUW

3.3 WP 4 – Cross-Reality Interaction and Authoring

3.3.1 Objectives and starting point of work

The objectives of the Cross-Reality Interaction and Authoring work package for year 2 are:

- **Interaction Prototyping/Authoring:** A graphical user interface on top of the language describing the interactions will be developed. This will be a major building block together with the language to support easy creation and evaluation of new interaction mechanisms.
- **Authoring and Orchestration Interface:** This tool supports the showcases by augmenting arbitrary maps with 2D information, e.g. text, objects, users. The functionality can be used to author a showcase event as well as orchestrating and monitoring the running event and evaluating an event by playback functionality.
- **Color Table:** Based on the feedback of users, we will further develop the interaction with this Tangible AR Setup. Adaptations of the interaction will be based on further feedback during the planned workshops and methods that are developed in WP3

[1] Panel Session 3: Urban Mixed Realities: Challenges to the Traditional View of Presence. Rod McCall, Ina Wagner, Kari Kuutti, and Guilio Jacucci

- **Audio/Video Streaming:** Publishing arbitrary audio and video sources to local and remote hosts in an efficient way, while providing a simple interface in order to access a stream. Integrate the streaming into the device abstraction.
- **Device-independent user interfaces:** Describe user-interfaces independent of the final execution development and devices available using a mark-up language and/or a MR interaction framework.
- **Mobile content tools:** A mobile tool for entering media (images, video, sound) into the MR environments. Also includes a PC/server side components for importing the media wirelessly (short range wireless connection).
- **Two dimensional, extendable mobile tag reader for smartphones:** a tool for reading two dimensional bar codes for various purposes.

As starting point for this phase we had the first set of demonstrators developed within the last period of the project and for some of the demonstrators, evaluation results from the showcases who already used some of the developed demonstrators within their trials. Based on these evaluation results and further discussions between the research work packages and the showcases, we started this period with a four month review and re-design phase, where we decided which tools needed to be further enhanced in means of functionality, stability, accessibility and so on. Additionally, we decided which tools should be newly developed and which tools currently don't require additional work, e.g. DEVAL has not been worked on due to other preferences by the showcases. The results of this phase for each of the tools developed within year 2 are documented within the deliverable D4.2 as sub-sections of each of the tools.

The results were regularly reported to the consortium and the showcases for feedback and improvements.

3.3.2 Progress towards objectives

Based on the results of the review and re-design phase we continued working on the following tools from phase I:

The Interaction Prototyping Tool has implemted a Graphical Editor that allows the application developer to use a visual programming environment for defining the application logic. Additionally, the language features have been extended by a template mechanism, that allow reusing pre-defined objects the type binding.

AuthOr has been completely redesigned, especially separating low level map tile and gudermanian coordinate math from display functionality. This will allow easier porting to other platforms and/or languages, e.g. Symbian. AuthOr is now available for Windows platforms and Windows Mobile 5/6 devices, such as PDAs and Handhelds. Additionally, new overlays have been implemented.

MRIML (Modeling Language for Mixed Reality Interfaces) is an UIDL that allows non-developers to describe an interactive application with different types of interaction techniques, modalities of use and computing platforms. MRIML has been a tool initially developed within the Timewarp showcase, and now is part of this work package in order to provide it to other interested showcases as well. In the first demonstrator of the Timewarp showcase, it has been used to define most of the application logic.

The ColorTable – as well – has been redesigned which resulted in new color tokens, new interaction modules and a new workspace organization.

OpenVideo now allows switching between multiple dynamic videos and is able to send and receive multiple streams in parallel.

Some of the additional nodes for OpenTracker have been revised and re-designed, including the SpaceDevice and the GoGo Interaction Modules, the SysMouseSink and the Food Pedal interaction.

Also based on the result of the review phase, we have developed the following new technologies from the scratch:

The Multi-touch display is a technology that is used to create displays in public spaces. The technology supports creation of multi-touch screens that are several meters wide and located either indoors or outdoors. The system can be used simultaneously by several users

The Mobile Media Collector (MMC) is a mobile device and a set of accompanying application(s) for supporting collecting, browsing, and saving location specific and directional media (using a digital compass) related to a urban design site.

The Location Based Media Browsing on Paper Maps tool enables the user to view location based media on top of the map image projected on a smartphone camera screen. The map image is grabbed from the phone camera, as the user holds the camera on front of the map. The overlayed media can be various things, e.g. photographs, locations of other uses, event locations or other information related to any event.

Due to the new project partner University of Cambridge, who joined the consortium in September, the Augmented Map Table – a tabletop AR environment for augmenting maps with dynamic information – will be integrated and further enhanced within IPCity. The integration work has already started during this year.

3.3.3 Deviations from project work program

No major deviations to report.

3.3.4 List of deliverables

Del. no.	Deliverable name	Date due	Actual / Forecast delivery date	Estimated indicative person-months *)	Used indicative person-months *)	Lead con-tractor
D4.2	First Prototypes of Interaction Tools	M24	M24			FIT

*) if available

3.3.5 List of milestones

Milestone no.	Milestone name	Date due	Actual/Forecast delivery date	Lead contractor
M4.3	Design specification of second set of interaction and authoring tools.	M16	M16	FIT
M4.4	Evaluation report on second set of interaction and authoring tools.	M24	M24	FIT

3.4 WP 5 – Next Generation Mixed Reality Infrastructure

3.4.1 Objectives and starting point of work

Initial tests with first mobile demonstrators gave promising results concerning hardware and software requirements. The initial software components for augmented and mixed reality applications on different mobile devices will continue according to the requirements of the various emerging showcase applications. In this context, sub-notebook but also PDA-based as well as smart phone-based settings seem to be useful for different showcase scenarios. Therefore, we will continue the core development for these kinds of devices. In addition, a persistent collaborative database seems to be inevitable in order to exchange data between

various devices. Although the infrastructure for indoor tracking could be provided by a commercial product, outdoor tracking is still an open research field. We will further work on the localization and tracking of outdoor users by fusing different types of tracking modalities such as GPS, inertia and vision-based systems. Specifically, we will work on software and hardware infrastructure for the following issues:

- MR projection: a video-augmentation projection system for the MR tent, where augmentation on the real-world can be achieved registered in an interactive way.
- Interaction table: a centralized interaction table will act as the main user interface in the MR tent. The existing demonstrator, a table-top display with tangible interfaces, will further be developed.
- Master interface: A control interface will be required where most of the provided services (in the MR tent and mobile setups) can be observed and filtered.
- Mobile setups (handheld mixed reality environments): three different mobile devices (scaled in computing performance) will further be developed: a sub-notebook-based (UMPC-based) approach, a PDA-based approach, a smartphone-based approach.

Tracking and localization: Vision-based tracking and localization will further be developed in order to get more precise positioning for outdoor MR applications. In addition, a first prototype for ubiquitous tracking will be developed which allows a seamless transition of users moving between different tracking services.

3.4.2 Progress towards objectives

One technology, the 'Mobile Presence Scanner' was evaluated and for the time being considered as stable and sufficiently complex to fulfill the current needs of the showcases. This component will be extended on requests of the showcases. All other components of the set of the initial demonstrators for MR infrastructure were continued developing. We furthermore started the development of 4 new components driven by the needs of the different showcases.

An overview as well as a complete description of the progress of each individual technology is given in the deliverable D5.2.

3.4.3 Deviations from project work program

No major deviations to report.

3.4.4 List of deliverables

Del. no.	Deliverable name	Date due	Actual / Forecast delivery date	Estimated indicative person-months *)	Used indicative person-months *)	Lead con-tractor
D5.2	First Prototypes for MR Infrastructure	M24	M24			TUG

*) if available

3.4.5 List of milestones

Milestone no.	Milestone name	Date due	Actual/Forecast delivery date	Lead contractor
M5.4	Report on results of first testing and evaluation and changes to initial	M19	M19	TUG

	demonstrators			
M5.5	Start evaluation the second set of MR infrastructure	M21	M21	TUG
M5.6	Report on results from evaluation	M24	M24	TUG

3.5 WP 6 – Showcase 1: Urban Renewal

3.5.1 Objectives and starting point of work

The objective of this work package is to introduce mixed reality applications in support of presence into urban renewal projects; more specifically:

- To conduct field work in urban planning environments, involving users and researchers as reflective co-designers, from early exploring practice and visions to field trials with gradually more integrated scenarios and prototypes
- To design an application based on the MR-Tent infrastructure from WP5, equipped with a mixed-media workbench interface, in support of collaborative envisioning (in collaboration with WP5)
- To develop mobile technology for public participation supporting situated content creation
- To evaluate the experiences of field trials with the technologies in real urban planning settings, with special attention to participants' experience of presence and co-presence.

The objectives of Phase II were:

- To re-design the Urban Renewal applications based on evaluation findings of Phase I and to develop new functionalities;
- To carry out two participatory workshops in the context of real urban planning workshops;
- To, based on an analysis of fieldwork material from the workshops, develop advanced and more complex scenarios of use and translate these into technical requirements.

3.5.2 Progress towards objectives

After re-designing our early prototypes we in Phase II carried out three participatory workshops, again in the context of real urban planning projects.

For the first of these workshops we returned to the premises of the psychiatric hospital Sainte-Anne in March 2007, installing the re-designed versions of our early prototypes in a rented tent. We worked with two different user groups. The first group included the chief architect for Sainte-Anne, the director and a manager of the hospital, as well as a representative of the urban heritage institution of the city of Paris (ABF). The second group consisted of two participants from Sainte-Anne, several architects involved in an urban planning institute ('Ville en mouvement'), a journalist with a focus on urban issues, an urban sociologist, and a sound specialist (who was invited to explore the possibilities of working with sound).

Our second participatory workshop took place in September 2007 in Paris on the premises of a large urban renewal project – the planning of a new court house (TGI) close to the Seine and the Bibliothèque Nationale de France (BNF). Participants were a representative from the Ministry of Justice, architects, sound specialists, as well a few selected residents.In all three participatory workshops users related to the Urban Renewal prototypes in very positive and

constructive ways and constructively collaborated in modifying features and defining new features. Major issues related to presence and interaction in mixed-realty environments were addressed.

We in addition developed a third prototype (based on the ColorTable) supporting working with simple rules commonly used in urban planning for composing visual scenes. A first test of this new application was carried out in a small workshop with students from the University of Applied Art's ‚Urban Strategies' Master programme in December 2007.

- After each of these field trials the Urban Renewal prototypes were successfully further developed, enriched with additional functionalities as well as re-designed so as to better support collaborative activities and simplify interactions.
- Central issues of representation were addressed as well as the needs of different types of urban renewal projects;
- The need for an intense cooperation with different stakeholder representatives in the preparatory phase for each workshop and for clear experimentation protocols were identified;
- One insight from experimenting with different urban renewal situations with different participating stakeholders is that they result in complex, partially conflicting requirements, which potentially undermine the desired simplicity and transparency of interactions. This is reflected in the implications for redesign that are presented in D 6.2;
- Advanced scenarios of use were developed.

3.5.3 Deviations from project work program

None

3.5.4 List of deliverables

Del. no.	Deliverable name	Date due	Actual / Forecast delivery date	Estimated indicative person-months *)	Used indicative person-months *)	Lead con-tractor
D6.2	First prototype of Urban Renewal applications	M24	M24			TUW

*) if available

3.5.5 List of milestones

Milestone no.	Milestone name	Date due	Actual/Forecast delivery date	Lead contractor
M6.5	Analysis of participatory workshops and feedback to technology developers as well as WP3 completed	M24	M24	TUW
M6.6	Enhanced demonstrations of the Urban Renewal applications finished	M30	M30	TUW

3.6 WP 7 – Showcase 2: Large-Scale Events → Environmental Awareness

3.6.1 Objectives and starting point of work

In this showcase we aim at supporting presence in urban environments focusing on events that are “large-scale”. This refers to the number of visitor and spectator (crowds), the duration that extends over days the spatial distribution. The urban perspective includes addressing flows of visitors their interaction with spaces, visibility of the mobility networks and spatial distribution of events

In particular mixed reality is seen as a way to support presence for active spectatorship improving three aspects of their experience:

- Co-experience in spectator groups –supporting awareness, coordination and expressions (verbal, mediated, embodied) in a groups in both distributed and collocated interaction.
- Engagement to the event – beyond passive witnessing deeper cognitive and social processing of the event.
- Ubiquity and distribution in space. The spectator experience has to be considered beyond the limited time and space of the core of the event. Spectators navigate through and spent time in a variety of spaces during the event period. Ubiquitous media for event should support this experience pervasively.

The research includes experimenting with interactive interface layers of awareness cues about fellow visitors, collective media, transport and mobility network, and event happenings.

3.6.2 Progress towards objectives

In this second year M12-M24 WP7 had to re-design the demonstrators, create a new version of demonstrator and carry out a new round of field trials. The re-design has successfully moved forward the demonstrator with more articulated and substantially new mixed reality application in compare to year 1. The current demonstrators follow the plan of having a mobile, an installation and a pervasive component. In all components substantial advancement has been made. The mobile component has moved beyond CoMedia which was already field trialed in year 1 therefore WP7 has moved forward top investigate the augmented map lens as a new mobile component. The installation component has concretized in the CityWall a large multi-touch urban display, which was the object of extensive field trials. Finally some prototype development has interested Illuminate the pervasive component, which finally had a first prototype version. The Illuminate component has also now a working prototype and while the concept has been developed further towards an ambient guiding system, a new concept for navigating the urban space has been created: the idea of the mobile MapLens application is to augment real maps with location based and user created media.

The CityWall is a large public display, to which users can send their own media content using mobile phones, has been created that supports multi-touch interaction, thus enabling collaborative use of the display. This display called CityWall (formerly Contact Wall) was set up in a city center with the goal of showing information of events happening in the city. The installation has been successfully running from the beginning of May 2007 in the city center of Helsinki, Finland, and it has been part of multiple large-scale events. Several field trials of its use have been conducted resulting in two long papers accepted in CHI2008 and MUM2007 which received the conference’s Best Paper Award.

The showcase succeeded in carrying out field trials in three different large-scale events in Helsinki (Eurovision May 2007, Samba Carnival June 2007, Helsinki Festival August 2007).

The multitouch display was the object of demonstration in a B2B event of the advertising sector in August 2007 in Germany.

In addition the CityWall has been turned into a permanent installation coming in contact with several thousands citizens and visitors. In particular in the Helsinki Festival the CityWall was part of the official program of the night of the Arts and appeared in the National News paper Heslingin Sanmat as well as in the program of the event. The CityWall appeared in several media internationally, Design Week UK, Casamica Italy(magazine of Coriere della Sera), Italian National Television Rai Tre in the news , Italian radio the first channel interview.

The CityWall attracted a lot of attention also in the web. Our site http://citywall.org received more than 40 000 contacts. A video was posted in youtube , CityWall was referenced in a variety of important websites including slash.com including several blogs We received requests from all over the world to create similar installations.

We also created a start-up to commercialise the technology www.multitouch.fi. Three of the researchers that worked in WP7 have founded the company. The company is seeking funding, has successfully negotiated IPR with the University and is negotiating orders with its first clients.

Because of a variety of issues we suggest this workpackage is re-defined with a new topic. The reasons include: Firstly the exceptional success of the impact of WP7 Large-Scale Events. This workpackage achieved the highest success possible more attuned with the end of the project, hence the need to re-define the WP. We already had several publications in the best publication forums including best paper awards. The showcase results were included in official programs of several events, and participated in all important Helsinki events. This is complemented by a public Installation with tens of thousands users and a start-up company as the most successful exploitation

Secondly there is the volume of publications already published on the subject in HCI field by the group on Large –scale events: The research group published extensively in the best journals and conferences on Large-Scale Events making it harder in the future to continue on this topic as only incremental publishing will be possible which is hard to get accepted.

The idea then is to start with a new and fresh brief to keep the creativity level high. We also hope to then alleviate the problem of temporal events. Because these events only last a few days, they are therefore not ideal for trials as they set strong constraints on the timing and the extend of trialing that is possible, for example longitudinal studies are not possible. On the other hand we showed the potential for having succesful permanent installations.

One of the most important issue of Cities today is not addressed in IPCity, namely the issue of Environmental awareness. This is maybe the most important reason. As all the city organizations and the EU shows in the 7th Program the most important topic is now Environment and IPCity should take action by directing one of its showcases to Environmental Awareness. For this reason WP7 in months 25-38 in the Implementation Plan WP7 will be redefined as “Environmental Awareness”.

3.6.3 Deviations from project work program

No major deviations to be reported.

3.6.4 List of deliverables

Del. no.	Deliverable name	Date due	Actual / Forecast delivery date	Estimated indicative person-months *)	Used indicative person-months *)	Lead con-tractor
D7.2	Demonstrators of large-scale events applications	M124	M24	-	-	TKK

3.6.5 List of milestones

Milestone no.	Milestone name	Date due	Actual/Forecast delivery date	Lead contractor
M7.2	Set of demonstrators finished	M12	M12	TKK
M7.3	I7.4 (Internal Report): Evaluation report on initial large-scale event demonstrator and field studies	M24	M12	TKK

3.7 WP 8 – Showcase 3: TimeWarp

3.7.1 Objectives and starting point of work

The aim of this work package is the development of TimeWarp, a mixed reality game in an urban context that allows users to experience a city in the past, present and future with a large variety of different media channels and interaction devices. The TimeWarp application will incorporate state-of-the-art interaction and communication technologies such as camera cell phones, wearable computing devices and sensors to facilitate a new quality of mixed reality experiences. It will increase the understanding of interaction and collaboration across different mixed reality user interfaces and foster research and innovation for mixed reality entertainment applications.

For Phase II we set ourselves the following tasks and objectives:

- Development of the first TimeWarp prototype, based on the initial demonstrator and tools and infrastructure provided by WP4 and WP5.
- Development and evaluation of concepts and tools for
    - Cross-media mixed reality user interfaces and applications
    - Orchestration and authoring interfaces to allow a broad audience to shape the edutainment application.
- Advancing the research on Presence looking at the case of mixed reality edutainment applications
    - cues for ‘temporal and spatial presence in historical urban involvement’
    - engagement and augmentation to support presence in the event
- Testing and public demonstrations of the first TimeWarp prototype
- Evaluation of the firstTime Warp prototype.

3.7.2 Progress towards objectives

During this second phase of TimeWarp we implemented and evaluated the initial game concept developed in Phase I.

This first prototype of TimeWarp was realized as a single-user game. We implemented two game-front ends – the mobile AR system and the mobile information terminal. The mobile AR system was running on a laptop or an UMPC and the mobile information terminal was running on a Pocket PC.

A cross-media mixed-reality user interface based on state-of-the-art mixed reality technology provided by WP5 was realized. Also, an authoring to shape the TimeWarp application was realized using and extending tools provided by WP4.

To test the game play, the usability of the interaction techniques and the sense of presence playing with the first prototype in the city of Cologne, we developed appropriate evaluation

methods. This includes an early questionnaire for assessing sense of place and presence in mobile MR games.

In 13 test runs in August and September with 24 participants, we gathered data to check precence concepts developed within WP3. For exploration we have used video observations and interviews, and adapted MEC. The study of the TimeWarp systems yielded in some guidelines how to shape city MR games.

TimeWarp study also pointed to the need to consider the nature and types of locations chosen and the effect this will have on place and presence.

3.7.3 Deviations from project work program

No major deviations to be reported.

3.7.4 List of deliverables

Del. no.	Deliverable name	Date due	Actual / Forecast delivery date	Estimated indicative person-months *)	Used indicative person-months *)	Lead con-tractor
D8.2	First Time Warp Prototype + Evaluation Report	M24	M24			FIT

*) if available

3.7.5 List of milestones

Milestone no.	Milestone name	Date due	Actual/Forecast delivery date	Lead contractor
M8.4	Time Warp application re-design finished	M16	M16	FIT
M8.5	First Time Warp prototype	M18	M18	FIT
M8.6	(Internal Report): Report on Time Warp application re-design	M24	M24	FIT

3.8 WP 9 – Showcase 4: City Tales

3.8.1 Objectives and starting point of work

The main aim of IPCity is to create simple MR user interfaces that use more mature technical innovations to realize its target. StreetBeat (year one Demonstrator described in Deliverable D9.1) and the Leo's adventures content creation tool (described in section **Fehler! Verweisquelle konnte nicht gefunden werden.**) are based on Java (J2ME) and Flash developments without a traditional AR component rather, those solutions try to regard mixed reality from a psychological presence point of view by exploring how music can influence a sense of place and how animations can influence a sense of presence via 'mobility' and 'multimodality' including dynamic representations. City Tales helped extending the presence concept map in collaboration with WP3

For Phase II we set ourselves the following tasks and objectives:

- Elaborate field test of StreetBeat
- Develop measures and tools that encourage mixed reality content creation. Explore how we can create an atmosphere and natural approach towards mixed reality content creation for "ordinary" people.
- Identify the appropriate metaphors and tools for the intended target groups

- Create a web based story telling tool “Leo’s Adventures” as an integrated application building upon WP4&5 infrastructure and tools provided. Utilizing the Web 2.0 user generated content trends
- Create one common mixed reality story storage system
- Foster mixed reality story telling based on the developed story telling tools developed as part of City Tales phase one.

3.8.2 Progress towards Objectives

- Developed an early questionnaire for assessing sense of place and presence in phone based MR systems
- Completed a study of the Street Beat system, findings point to the effect that certain content items have on the sense of feeling inside or immersed.
- StreetBeat study also pointed to the need to consider the nature and types of locations chosen and the effect this will have on place and presence.
    - Most users of Street Beat said they would be willing to pay for it.
    - Although the navigational aspects of Street Beat could be improved most users found the existing system easy to use.
- Development of a web based story telling tool including 3D animation for user generated MR story telling.
- The application was redesigned several times following early prototype development issues this lead to a delayed milestone see M8.5 below.
- The application was evaluated in peer studies with the following results:
    - Quote from a freelance Graphic Designer: “…Leo is a likeable character and the initial drafts a clear and easy to understand and I can see how a certain clientele would use such an interface but I believe you will struggle to enable meaningful animation on videos…”
    - Quote from a Freeland 3D Animator: “… Less complex animations would be necessary to enable an easy merge of video material with 3D animations”
    - Quote from a video Artist: “…this is a intriguing idea an a bold and unpretentious approach to presence. The appliance will be difficult but I am certain you will be rewarded with a well worth it proof of concept.” were

3.9 Deviations from project work program

There was a delay of 3 months regarding the realization and demonstration of the Leo’s Adventures prototype due to restructuring of the organization and difficulties in developing the prototype using a flash client.

3.9.1 List of deliverables

Del. no.	Deliverable name	Date due	Actual / Forecast delivery date	Estimated indicative person-months *)	Used indicative person-months *)	Lead con-tractor
D9.2		M24	M24			Sony

3.9.2 List of milestones

Milestone no.	Milestone name	Date due	Actual/Forecast delivery date	Lead contractor
M8.4	StreetBeat filed trial	M16	M16	Sony
M8.5	Leo's adventures prototype	M18	M21	Sony
M8.6	(Internal Report): Report on City Tales application re-design	M24	M24	Sony

4 Consortium Management

4.1 Consortium Management Tasks

Achievements

The main achievements on the consortium management level were:

- Preparation and accomplishment of the call for participation (competitive call), including
  - Preparation of the call text
  - Publication of the call
  - Organizing the proposal evaluation
  - Reporting to the EC
  - Negotiating with new partner
- Preparation of second amendment to the project contract in order to reflect the changes in the consortium and the anticipated changes as presented at the year 1 project review
- Organization and accomplishment of the regular project meetings
- Organization and accomplishment of the monthly Executive Board meetings
- Organization and accomplishment of three Scientific Board meetings and three Management Board meetings
- Revision of the qualitative and quantitative measurements for progress and impact of work.
- Preparation of the year 2 management deliverables (this report, the evaluation summary report (D1.7), the 18-months plan for months 25-42).
- Preparation of the year 2 cost statement.
- Finding an appropriate replacement for the project partner SONY.

Problems

In May 2007 Sony decided to move the responsibilities of the project partner Sony NetServices (SNS) were to its grand-parent company Sony Europe (SONY), since its direct mother company Sony NetServices Austria was sold. Beside the responsibilities this shift included the movement of the existing project team to Sony Europe. This step had already been foreseen by the project's consortium agreement and was not restricted to IPCity but applied to all EU projects of SNS. The change actually became effective by September 2007. The change was reflected in the second amendment to the contract. While this change originally did not seem to have any impact on the participation of SONY in IPCity, it turned out pretty fast, that this change might complicate cooperation within the project. The reason was that the project was assigned to Sony Europe's BDIG (Business Development & Innovation Group). As a result, the feasibility of contributions by Sony to the project required a re-evaluation as even the use or evaluation of software developed by other project partners seemed to be difficult within the new unit.

Sony Europe BDIG is a business development group with no technological assets or infrastructure for technical product development. Therefore, Sony Europe BDIG was not able to perform the work as originally stipulated in the description of work.

It was discussed within the project's Scientific Board and Management Board whether the obligation of SONY within the project could be adapted to reflect this situation. It was stated

that this would not be possible based on information provided by SONY regarding their possible future contribution and the fact that IPCity is a FET Proactive project. Consequently SONY was asked to leave the consortium in order to be replaced by a new partner, which could fulfill SONY's original obligations.

The Management Board discussed possible new partners and finally asked three possible candidates for specific proposals regarding the possible contribution to the project. Based on this information and an internal discussion, the consortium selected Imagination from Vienna as replacement for SONY. The negotiations with Imagination were started immediately as they were supposed to become project partners from January 1st, 2008. SONY was asked to finish all RTD work until end of 2007 (project year 2) and to stay in the consortium until the project review end of February 2008 for proper reporting.

The problems regarding UniAK reported last year were less apparent but still recognizable within the first months of year 2. They could finally be solved when a new person at UniAK was established as primary contact. UniAk made up leeway with the usage of person months and an increase of additional effort of permanent staff enabled to partition work and ease internal communication.

4.2 Contractors

The problems faced regarding SONY and UniAK are described in detail in the previous sub-section.

There were a couple of changes within the individual project boards:

In the Executive Board the following work package leaders were replaced or will be replaced at the time of the year 2 review:

- Jan Ohlenburg will be replaced by Thorsten Fröhlich as WP4 leader starting from the year 2 review
- Denis Kalkofen(who had replaced Bernhard Reitinger) was replaced by Markus Sareika as WP5 leader
- Giulio Jacucci was replaced by Ann Morrison as WP7 leader
- Iris Herbst was replaced by Anne-Kathrin Braun as WP8 leader
- Sabiha Ghellal will be replaced by Zsolt Szalavari as WP9 leader starting from the year 2 review

In the Scientific Board Dieter Schmalstieg was re-elected as speaker of the board, Jean-Jacques Terrin again was elected as visiting member, and Giulio Jacucci joined the board as new member according to the regulations in the consortium agreement.

In the Management Board Ann Morrison replaced Giulio Jacucci as representative for TKK and Andrea Börner replaced Reiner Zettl as representative for UniAK.

4.3 Project Timetable and Status

In general, almost all project activities are in line with the original description of work.

WP3: Research on sound, which had been envisioned primarily for WP6, was shifted to WP3, as it concerns several showcases. It was also strongly focused on presence issues. Given the complexity of this medium and the research needed, the workshop with sound experts was shifted to M28. Another still open issue is research on gender aspects. We feel that more experience with the concept map has to be gained before addressing gender issues and integrating them into the showcase evaluation events. This has been foreseen for M33-36.

A formal deviation within UniAK´s planned PM budget was the shift of person months from WP6 to WP5; in the detailed work plans for months 1 - 24, the development of the MRTent was erroneously allocated to WP6. For the following periods, UniAK will readjust the allocation of PMs between WP5 and WP6.

WP6: The special participatory workshop with a focus on sound was shifted to M36-37. We had to abandon the idea of an IPCity roadshow due to the costs of preparing participatory workshops within the context of real urban projects and of transporting and setting up all the equipment (including the MR-tent).

WP7: The project timetable will change for months 25-42 with a design and development phase for the Environmental Awareness package. This package works with Augmented Map Lens, Illuminate and CityWall technologies and a first prototype implementation to showcase the work is envisaged in June with trials with MapLens and then in November with a permanent installation as part of Forces of the Night festival utilizing CityWall and Illuminate technology.

Deviations from cost or person-months budgets

The tables below shows the actual use of person months by each project partner within the previous working period. It also shows the number of planned person months for this period. Please note, that there actually has never been a specific plan for the 12-months working period. All efforts are calculated from the 18-months plan (using 2/3 of the person months for each work package). While this may be correct in case of linear usage of resources, it may differ from the actual work plan significantly for individual work packages and/or project partners. Thus, even while this table – in our opinion – has some significant shortcomings, we provide it here upon particular request of last year's reviewers.

RTD		TOTALS	Coord. FhG/FIT	TUW	TUG	UOulu	UniAk	UMLV	TKK	SONY	AAU	UCAM DENG
Workpackage 1: Consortium and Project Management	actual	**4.9**	2.0	0.6	0.5	0.5	0.2	0.2	0.0	0.9	0.0	0.0
	planned	**8.0**	3.3	0.7	0.7	0.7	0.2	0.3	0.7	0.7	0.7	0.1
Workpackage 2: Dissemination and Knowledge Management	actual	**4.4**	1.0	0.7	0.7	1.5	0.2	0.3	0.0	0.0	0.0	0.0
	planned	**7.0**	1.0	0.7	0.7	1.3	0.2	0.3	0.7	1.3	0.7	0.1
Workpackage 3: Cross-Reality Presence and Experience	actual	**29.8**	2.7	9.0	0.0	3.5	0.0	5.0	9.6	0.0	0.0	0.0
	planned	**23.7**	2.7	9.1	0	2.7	0	2.5	6.7	0	0	0
Workpackage 4: Cross-Reality Interaction and Authoring Tools	actual	**27.6**	7.1	4.7	3.0	6.5	0	0.0	5.3	0.0	0.0	1.0
	planned	**27.9**	8.0	3.7	2.7	9.3	0	0	2.7	0.7	0	0.8
Workpackage 5: Mixed Reality Infrastructure	actual	**39.0**	6.8	2.0	8.6	9.0	2.6	0.0	0.0	0.0	8.0	2.0
	planned	**44.0**	8.0	2.0	10.0	9.3	0	0	2.0	0.7	10.0	2.0
Workpackage 6: Urban Renewal Showcases	actual	**26.4**	0.2	11.8	1.0	1.5	2.0	6.5	0.0	0.0	3.4	0.0
	planned	**25.6**	0.7	10.4	2.3	1.3	3.3	5.3	1.3	0	0.7	0.2
Workpackage 7: Large-Scale Events Showcase	actual	**20.7**	0.2	1.0	0.0	2.0	0.0	1.5	16.0	0.0	0.0	0.0
	planned	**18.9**	0.7	1.0	2.3	1.3	0	1.3	10.7	0.7	0.7	0.2
Workpackage 8: Time Warp Showcase	actual	**15.7**	11.3	0.6	0.0	0.5	0.0	1.5	0.0	1.8	0.1	0.0
	planned	**17.5**	11.3	0.7	0.7	0	0	1.3	0	3.3	0.0	0.2
Workpackage 9: City Tales Showcase	actual	**25.1**	4.8	1.2	0.2	0.5	0.0	1.5	0.0	16.0	0.8	0.0
	planned	**17.5**	5.3	1.3	0.7	0	0	1.3	0	8.0	0.7	0.2
Reserved	actual	**0.0**										

	planned	**61.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RTD total	actual	**193.6**	36.1	31.6	14.0	25.5	5.0	16.5	30.9	18.7	12.3	3.0
	planned	**190.0**	41.0	29.6	20.0	26.0	3.7	12.5	24.7	15.3	13.3	3.8

DEMONSTRATIONI		**TOTALS**	Coord. FhG/FIT	TUW	TUG	UOulu	UniAk	UMLV	TKK	SONY	AAU	UCAM DENG
Workpackage 6: Urban Renewal Showcases	actual	**2**	0	0.3	0.3	0	0.2	1	0	0	0	
	planned	**2**	0	0.3	0.0	0.3	0.3	0.7	0.3	0	0	0.1
Workpackage 7: Large-Scale Events Showcase	actual	**1**	0	0	0	0	0	0	0.5	0	0	
	planned	**2**	0	0.3	0	0.3	0.3	0.2	0.3	0	0	0.1
Workpackage 8: Time Warp Showcase	actual	**0**	0	0	0	0	0	0	0	0	0	
	planned	**1.2**	0.3	0	0	0	0	0.2	0	0.3	0.2	0.1
Workpackage 9: City Tales Showcase	actual	**0**	0	0	0	0	0	0	0	0	0	
	planned	**1.2**	0.3	0	0	0	0	0.2	0	0.3	0.2	0.1
Reserved	actual	**0**										
	planned	**0**	0	0	0	0	0	0	0	0	0	0
DEMONSTRATION total	actual	**2**	0	0.3	0.3	0	0.2	1	0.5	0	0	0
	planned	**6**	0.7	0.7	0	0.7	0.7	1.3	0.7	0.7	0.3	0.4

TRAINING		**TOTALS**	Coord. FhG/FIT	TUW	TUG	UOulu	UniAk	UMLV	TKK	SONY	AAU	UCAM DENG
Workpackage 4: Cross-Reality Interaction and Authoring Tools	actual	**1.2**	0.3	0	0.5	0.3	0	0	0	0	0	0
	planned	**0.5**	0	0	0.5	0	0		0	0	0	
Workpackage 5: Mixed Reality Infrastructure	actual	**1.2**	0.2	0	0.5	0	0	0	0	0.2	0.3	0
	planned	**0.9**	0	0.4	0.5	0	0		0	0	0	
Workpackage 6: Urban Renewal Showcases	actual	**0.7**	0	0.3	0.2	0.2	0	0	0	0	0	0
	planned	**1.6**	0	0	0	0	0		1.6	0	0	
Workpackage 7: Large-Scale Events Showcase	actual	**1.3**	0	0.3	0.2	0.2	0	0	0.7	0	0	0
	planned	**0**	0	0	0	0	0		0	0	0	
Workpackage 8: Time Warp Showcase	actual	**0.2**	0	0	0	0	0	0	0	0.2	0	0
	planned	**0**	0	0	0	0	0		0	0	0	
Workpackage 9: City Tales Showcase	actual	**0.3**	0	0	0	0	0	0	0	0.3	0	0
	planned	**0**										
Reserved	actual	**0**	0	0	0	0	0	0	0	0	0	0
	planned	**3**	0	0.4	1	0	0	0	1.6	0	0	0
TRAINING total	actual	**3**	0	0.4	1	0	0	0	1.6	0	0	0
	planned	**4.8**	0.5	0.7	1.3	0.7	0	0	0.7	0.7	0.3	0

MANAGEMENT		**TOTALS**	Coord. FhG/FIT	TUW	TUG	UOulu	UniAk	UMLV	TKK	SONY	AAU	UCAM DENG

Workpackage 1: Consortium and Project Management	actual	**4.9**	4.9									
	planned	**6**	6									
MANAGEMENT total	actual	**4.9**	4.9									
	planned	**6**	6									

TOTAL ACTIVITIES		**TOTALS**	Coord. FhG/FIT	TUW	TUG	UOulu	UniAk	UMLV	TKK	SONY	AAU	UCAM DENG
total	actual	**204**	41	32.3	15.3	25.5	5.2	17.5	33	18.7	12.3	3
	planned	**207**	48.2	30.9	21.3	27.3	4.4	13.9	26	16.7	14	4.2

At FIT especially management and administration efforts differed from the original estimation for year 2 (in almost all other areas the deviation was less than 1PM). One reason for this is that most management effort for the year 1 review was already at the end of year 1, while a significant share of the management effort for the year 2 review was actually at the beginning of year 3. Totally, FIT was able to increase the overall PM effort significantly compared to year 1, reaching the necessary average for the project per year. However, FIT was not yet able to fill up the gap based on initial recruiting problems at the beginning of year 1 due to some key researchers leaving the project unexpectedly after year 2. FIT meanwhile already hired appropriate substitutes and is pretty confident to finally catch up regarding the overall use of their resources during the third year.

PROJECT BARCHART and STATUS

Acronym:	IPCity
Contract N°	27571

Month	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	M26	M27	M28	M29	M30	M31	M32
Year	2nd year												3rd year							
Workpackage 1:																				
	Mangement																			
Task 1.6	Competitive call																			
Task 1.7	Organ. of year one review																			
Task 1.8	Organ. of general project meetings																			
Task 1.9	Monthly meetings of the Executive Board																			
Task 1.10	Regular meetings of the Scientific Board																			
Task 1.11	Coord. of year one review take-up measures																			
Task 1.12	Prep. of the consolidated evaluation report																			
Task 1.13	Preparation of the third 18-months plan																			
Task 1.14	Organ. of year two review																			
Task 1.16	Coord. of year two review take-up measures																			
Workpackage 2:																				
	Dissemination																			
Task 2.6	Improvement of dissemination strategy																			
Task 2.7	Dissemination of project results																			
Task 2.8	Evaluation of dissemination activities																			
Task 2.9	Improvement of dissemination strategy for phase III																			
Workpackage 3:																				
	Cross-Reality Presence and Experience																			
Task 3.5	Probe, extend and consolidate methods																			
Task 3.6	Plan evaluation of gender aspects																			
Task 3.7	Further test of conceptual framework																			
Task 3.8	Data analysis, feedback to concept map																			
Task 3.9	Formulate guidelines for interface design																			
Task 3.10	Redesign of concept map																			
Workpackage 4:																				
	Cross-Reality Interaction and Authoring																			
Task 4.4	Re-design of first set of tools																			
Task 4.5	Development of second set of tools																			
Task 4.6	Testing of second set of tools																			
Task 4.7	Evaluation of second set of tools																			
Task 4.8	Re-design of second set of tools																			
Task 4.9	Development of third set of tools																			
Workpackage 5:																				
	Mixed Reality Infrastructure																			
Task 5.4	Re-design based on tests and evaluations																			
Task 5.5	Development of second set of prototypes																			
Task 5.6	Testing second set of prototypes																			
Task 5.7	Evaluation based on feedback from the showcases																			
Task 5.8	Re-Design of MR infrastructure prototypes																			
Task 5.9	Development of third set of prototypes																			
Workpackage 6:																				
	Showcase 1: Urban Renewal																			
Task 6.8	Redesign of Urban Renewal applications																			
Task 6.9	Development of first sound probes																			
Task 6.10	Development of new functionalities																			
Task 6.11	Third cycle of participatory workshops																			
Task 6.12	Data analysis, advanced scenarios																			
Task 6.13	Redesign of Urban Renewal applications																			
Task 6.14	Participatory workshop with focus on sound																			
Task 6.15	Development of new functionalities																			
Task 6.16	Negotiations with European cities on workshops																			
Workpackage 7:																				
	Showcase 2: Large-Scale Events																			
Task 7.6	Re-design of applicaiton prototypes																			
Task 7.7	Preparation of field trials																			
Task 7.8	Public field trials																			
Task 7.9	Analysis of field trials																			
Task 7.10	Re-design of WP as Environmental Awareness																			
Task 7.11	Development of new version of components																			
Workpackage 8:																				
	Showcase 3: TimeWarp																			
Task 8.5	Re-design of TimeWarp application																			
Task 8.6	Development of first TimeWarp prototype																			
Task 8.7	Testing and public demonstration																			
Task 8.8	Evaluation of the first Time Warp prototype																			
Task 8.9	Re-design of first TimeWarp prototype																			
Task 8.10	Development of the second TimeWarp prototype																			
Workpackage 9:																				
	Showcase 4: City Tales																			
Task 9.5	Re-design of City Tales application																			
Task 9.6	Development of first City Tales prototype																			
Task 9.7	Testing and public demonstration of Leo's Adv.																			
Task 9.8	Evaluation of Leo's Adventures																			
Task 9.9	Re-design of Leo's Adventures																			
Task 9.10	Development of "Streetbeat" event																			

Communication and Meetings

Communication Issues

All project-internal communication issues and mechanisms (including emails, documents, meetings, minutes, internal review mechanism, publications, etc.) are set down in detail in the project handbook, which has been updated according to recent requirements. All dissemination issues (including the public web page, the Wiki, and the newsletter) are also dealt with in the dissemination plan.

Communication between the individual project partner has been promoted by the use of 14 email lists tailored to the individual needs of the project structure (one for all people involved in the project, one for each board, one for administrative issues, one for each work package). All email lists are archived and can be browsed through the Internet by any project member.

Further, the BSCW shared workspace system hosted by FIT is used as the main platform for the exchange of documents and software, the collaborative preparation of deliverables and reports, polls regarding specific project issues, etc. It is further used for electronic provision of deliverables to the EC and the project's reviewers.

While the IPCity web server is maintained by UOulu, all partners are required to contribute and especially each work package leader is responsible for updates of WP related information. The IPCity newsletter is used to distribute information not only outside but also inside the project related to the project topics.

Meetings

During the second phase of the project (year 2, months 0 -12) three general project meetings took place: the first review meeting at FIT in St. Augustin (February 26-28, 2007), the second assembly at TKK in Helsinki (May 22-25, 2007), and finally the third organized by ULMV in Paris (Oct. 17-19, 2007). Beside these meetings, a large number of bilateral and multilateral working meetings and workshops (often including parties from several work packages) took place. Additionally, at Sep. 3, 2007, there was a kick-off meeting in Cambridge regarding the collaboration with the new project partner UCam DENG joining the project as a result of the competitive call.

There were three meetings of the Scientific Board: one at each general project meeting.

The project's Executive Board met in person at each project meeting. Additionally there were monthly telephone conferences of the Executive Board, checking and coordinating the monthly project progress according to the monthly internal progress report provided by each work package leader based on the input received from the individual work package participants.

Member from the project consortium as well as the whole project were also involved in the presence related workshop in Pisa, the PEACH summer school in Santorini, and the Human-Computer-Confluence workshop at the EC in Brussels.

Co-operations

The project already cooperates with the PRESENCCIA project and the IPerG project. These co-operations are mainly driven by shared partners and/or shared activites. TUG, that also is partner of PRESENCCIA and FIT cooperate with PRESENCCIA in the area of solutions for ubiquitous tracking. FIT and SONY, that both also participate in IPerG- the EC's IP on pervasive gaming, ensured that results from IPerG were considered for the related showcases 3 and 4 (WP8 and WP9) and vice versa.

In was anticipated to include HITLAB NZ, New Zealand, which is well know world-wide for their experience and contribution in the area of Mixed Reality, into the IPCity consortium as there already is an exchange regarding researchers between HITLAB and some project

partners. It was further anticipated to establish an additional showcase in New Zealand. This however, has not been possible due to some development in New Zealand. Thus, in order to benefit from the high expertise at the HITLAB NZ, it was decided by the project's Scientific Board and approved by the Management Board to assign 50k€ for training purposes, which allows researchers to visit HITLAB for periods of approx. 1-3 months (to be included in the 3rd amendment to the contract, subject to approval by the EC).

TUG cooperates with the WkiVienna project in the development of the interactive 3D reconstruction component, which is part of workpackage 5.

5 Other Issues

5.1 Implementation of the Competitive Call

A competitive call had been implemented in line with the appropriae EC regulations. The call was initially announced to the EC at Dec. 4, 2006. The initial call text had been sent to the project officer at January 11, 2007. Due to the fact that the EPSS could not be used for the call (in contrast to the regulations described in the corresponding EC documents), the call text was adapted to this.

The call for new partners was initially published on March 4th on the IPCity web site, in three major national newspapers on March 21 and March 22, 2007, and in the project related journal JUCS on March 22, 2007. Further, it was published on CORDIS at March 23, 2007.

Based on those dates the deadline for proposals was May 3, 2007, 17:00 CEST.

The Scientific Board proposed three possible external reviewers – all known experts in the field – to the EC, which were approved by the EC on May 3, 2007:

- Prof. Nassir Navab, TU Muenchen, Germany
- Dr. Vincent Lepetit, EPFL Lausanne, Switzerland
- Prof. Hirokazu Kato, Nara Institute of Science and Technology, Japan

Three proposals were received:

- University of Cambridge, UK (Dr. Tom Drummond)
- Servimaps, Spain (Mr. Ortis Casar Santos Manuel)
- University of Coventry, UK (Dr. Fotis Liarokapis)

The reviews were received by May 23, 2007. The originals were forwarded to the EC. University of Cambridge was selected as new project partner based on the review results. The proposers were informed about the review results at May 28, 2007.

Based on the documentation provided, the EC approved the overall implementation of the competitive call by June 18, 2007. Immediately after this, the negotiations with the University of Cambridge were started. Negotiatiations were finished by end of August and the new partner joined the consortium by September 1, 2007.

Due to pending signatures from Cambrindge to required documents including but not limited to the consortium agreement, the official amendment to the contract could not be sent to the EC until November 29, 2007. It is still subject to approval by the EC.

Nevertheless the new partner University of Cambridnge (UCam DENG) resumed its work in the consortium as anticipated at September 1, 2007.

6 Annex: Plan for Using and Disseminating Knowledge

6.1 Exploitable knowledge and its use

At this stage of the project some exploitable objects start to emerge. In WP7 and WP4, the CityWall (Multi-Touch Display) has already been successful resulting in a spinoff company to further develop the concept and technology. It can also be seen that in other work packages a number of components for integration and possibly later, for exploitation, can be identified.

WP3:

- an original conceptual (concept map) and methodological contribution to research on presence and experience in mixed media environments; a conceptual and empirical exploration of sound and presence

WP4:

- a device-independent cross-platform access mechanism, based on DEVAL, OpenTracker and OpenVideo
- two authoring tools: Interaction Prototyping Tool and AuthOr
- Multi-Touch Display

WP5:

- Interactive 3D reconstruction using a combination of the AR Scouting and the 3D Reconstruction technologies
- Location aware content management (retrieval, processing, appending) using the Distributed Media Entrance and Management technology and any combination of developed tracking technologies
- Software framework enabling MR on handheld devices, sub-notebook devices or semi-stationary device
- MR tent

WP6:

- several novel application concepts: barcode interface, tangible 3D visualization, sound application, UrbanSketcher, history application, urban rules application,
- several novel mixed reality concepts: see-through augmentation, real time video augmentation and (static or dynamic) ‚panorama'
- several novel interaction concepts based on tangible user interface (ColorTable)

WP7:

- three novel application concepts: Augmented Map Lens (a mobile group media application with awareness cues and optical markers, being updated to add dynamic content to local maps); CityWall, (a multi-touch screen installation for groups of visitors and a permanent installation)—now its own start-up company and attracting new clients; Illuminate (a pervasive installation to visualize paths and social interactions).

WP8:

- several novel game concepts for MR outdoor gaming
- novel concepts for handheld mixed reality interactions

WP9:

- two technology probes: a tangible user interface allows content creation for everyone, and a location aware mobile, music based City tour.

6.2 Dissemination of knowledge

The following overview table of dissemination events shows an expectable pattern: during the second year the technology developed in the project has started to mature, leading to a number of technology-related publications. It has also led to more ambitious and extensive field trials, first of which have also already lead to publications. The conceptual and theoretical work in WP3 has lead to increasing contacts with the Presence community, although the actual publications are still in the preparation. The volume and quality of publications has been increasing steadily, and first journal publications have emerged. The selection of publication venues shows at the moment a clear emphasis on human-computer interaction and mixed reality environments. The mixed-reality interaction innovation in WP7 which has also led to the formation of a spin-off company, has generated a lot of good publicity.

Planned/actual Dates	Type, name and location	Type of audience	Countries addressed	Size of audience	Partner responsible /involved
January 07	TV report, RTL2 network, Germany	General	Germany	Na	FIT
March 07	Conference, IEEE Virtual Reality 2007, USA	Research	international	Na	FIT
March 07	Conference, IEEE Virtual Reality 2007, USA	Research	international	Na	TUW
March 07	Conference, IEEE Virtual Reality 2007, USA	Research	international	Na	TUG
March 07	Workshop on Urban Planing, Sainte-Anne, Paris, France	Research	international	25	TUW, TUG
March 07	Workshop on Urban Planing, Sainte-Anne, Paris, France	Research	international	25	UMLV
March 07	Workshop on New technologies for urban praticipation, Japan	Research	International	Na	UOulu
March 07	Conference, SCAN'07, Belgium	Research	International	Na	UMLV
March 07	Conference,« Hyperurbain **»,** Université de Paris 8, France	Research	International	Na	UMLV
April 07	Conference, ACM CHI'07, USA	Research	international	Na	FIT
April 07	Conference, ACM CHI'07, USA	Research	international	Na	TUG
April 07	Conference, ACM CHI'07, USA	Research	international	Na	TKK
April 07	Conference, ACM CHI'07, USA	Research	international	Na	UOulu
May 07 – Sep 07	During summer, CityWall has been part of many events in Helsinki: The Eurovision Song Contest, Samba Carnaval and Helsinki Festival	General	Finland	Thousands	TKK
June 07	Presentation, LTMU/Université de Paris 8	Research	France	20	UMLV
June 07	Presentation, CNRS-UMR	Research	France	30	UMLV
June 07	Conference, PerGames 2007, poster	Research	International	Na	FIT
July 07	Summer school, PEACH, Greece	Research	international	Na	TUG, FIT, TUW
July 07	Conference, UAHCI 2007, China	Research	international	Na	FIT
Aug 07	CityWall appeared in the National News paper Helsingin Sanomat as well as in the program of Helsinki	General	Finland	Na	TKK

Planned/actual Dates	Type, name and location	Type of audience	Countries addressed	Size of audience	Partner responsible /involved
	Festival event.				
August 07	Conference, IRIS30, Finland	Research	international	Na	UOulu
August 07	Conference, ACM SIGGRAPH, USA	Research	International	Na	FIT, SONY
September 07	TGI de Paris, Workshop on Urban Planing, Paris, France	Research	international	12	TUW, TUG
September 07	TGI de Paris, Workshop on Urban Planing, Paris, France	Research	international	12	UMLV
September 07	Conference, DIGRA2007, Japan	Researah	international	Na	UOulu
October 07	Public presentation, “Draussen in der Stadt“, Vienna, Austria	General	Austria	20	TUW, TUG
October 07	Public presentation, “Draussen in der Stadt“, Vienna, Austria	General	Austria	20	UMLV
October 07	Public presentation, “Open day at TU Graz”, Graz, Austria	General	Austria	50	TUW, TUG
October 07	Conference, Presence 2007, panel, Spain	Research	international	Na	UOulu, FIT, TKK
November 07	Presentation, MRTE/Université de Cergy-Pontoise	Research	France	Na	UMLV
November 07	Conference, IEEE, ACM ISMAR 2007, Japan.	Research	international	Na	TUG
November 07	Conference, GROUP 2007, USA	Research	international	Na	TUW
December 07	Conference, MUM 2007, Finland	Research	international	Na	TKK
December 07	Conference, Annual Conference of Finnish Social Psychologists, Finland	Research	Finland	Na	TKK
December 07	Italian National Television Rai Tre in the news and Italian radio, the first channel interview	General	Italy	Na	TKK
December 07	Presentation, Ecole d’architecture de Versailles	Research	France	30	UMLV
December 07	Presentation, Ecole des Ponts et Chaussées	Research	France	30	UMLV
December 07	Conference, HC2007, Düsseldorf/Aizu-Wakamatsu/Tokyo	Research	Germany, Japan	Na	FIT
All year 07	CityWall has been appeared in tens of news sites and blogs in the Internet, see D7.2 Dissemination chapter for further details	General	international	Na	TKK
January 08	Conference, IEEE Winter Vision Meeting, USA	Research	International	Na	AAU
February 08	Conference, ACM tangible and embedded interaction, Germany	Research	International	Na	TUW
March 08	Conference, IEEE Symposium on 3D user interfaces, USA	Research	International	Na	FIT
March 08	Conference, IEEE VR, two posters, USA	Research	International	Na	FIT
April 08	Conference, ACM CHI 2008, Italy	Research	International	Na	TKK
April 08	Conference, ACM CHI 2008, Italy	Research	International	Na	FIT
April 08	Conference, ACM CHI 2008, Italy	Research	International	Na	SONY, FIT
April 08	Conference, ACM CHI 2008, Italy	Research	International	Na	TUG

6.3 Publishable results

As a result of project dissemination activities during 2007 two TV reports (German, Italy) and one radio report (Italy) have been published. Members of the project have participated and made presentations in 23 conferences and workshops around the world. Altogether 22 workshops, demonstrations and field trials together with showcase stakeholders and end-users have been conducted in the showcases. Two journal publications, 18 conference papers and 13 workshop papers and posters have been published. The main emphasis in publication during the year has been in forums for human computer interaction (HCI) and Mixed Reality.

From the research performed within the IPCity proeject, a start-up to commercialize the multitouch technology emerged (see www.multitouch.fi). Three of the researchers that worked on this technology founded the company. The company has successfully finished negotiations regarding IPR with the University of Helsinki/TKK. TKK owns the software license, royalties from sales of the license are paid to TKK and further developments of the software are in turn delivered back to TKK.

Acknowledgements and Further Information

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For further information regarding the IPCity project please visit the project web site at:

ipcity.eu