

4-3-2009

# Supporting the Formation of Communities of Practice: Urban Planning in the MR-Tent

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## Recommended Citation

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## Supporting the Formation of Communities of Practice: Urban Planning in the MR-Tent

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### Abstract

We have developed a prototype of an integrated framework of tools, an MR application supporting a range of devices for collaborative multimodal interaction and individual expression. These tools allow groups of stakeholders in an urban project create and manipulate visual and auditory scenes, and mesh these scenes with the real environment of an urban planning site as an integral part of expressing and experiencing an evolving project. The technical infrastructure is housed in a specifically designed MR Tent (Figure 1), which allows bringing technologies that are normally available only in laboratory settings to the site of an urban project. On top of designing these tools in a user-centered design process, we have also developed an approach to supporting multiple interactions among the various agents (professionals, as well as lay people, referring to different temporal and spatial scales, representing various cultures) in real complex urban environments. We contend that when introducing participatory technologies, methods are needed that facilitate the constitution of multidisciplinary teams founded on public-private and local actors-global operators partnerships [Bourdin et al. 2006].

**Keywords:** communities of practice, urban planning, research intervention, participatory technologies

**Permanent URL:** <http://sprouts.aisnet.org/9-17>

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**Reference:** Wagner I., Basile M., Ehrenstrasser L., Maquil V., Terrin J.J., Wagner M. (2009). "Supporting the Formation of Communities of Practice: Urban Planning in the MR-Tent," Proceedings > Proceedings of ALPIS itAIS, Italy . *Sprouts: Working Papers on Information Systems*, 9(17). <http://sprouts.aisnet.org/9-17>

## 1. INTRODUCTION

Urban design today faces complex and heterogeneous technical, political, economic, and social demands. One source of this complexity is the large number of stakeholders implicated in urban design, each of them representing diverse professional cultures, academic training, and economic logics. The designed artefacts, whether buildings, infrastructures or open spaces, are also becoming more complex; they are embedded within more and more sophisticated technologies and offer numerous services. Risk is present in most aspects of urban planning: economic, political, social, financial, environmental, and interaction between these different fields adds to the complexity as a whole [Beck 1986]. Life cycle analysis has an augmented importance in decision making. Moreover, final users, their cultural background and values [Taylor 1992] play an increasing role during all phases of an urban project.

Given this complexity, negotiation between stakeholder perspectives, political objectives, the expectations of citizens, and the demands of planning, becomes a necessity.

It involves considering the local and the global, the short and the long term, the private and the public, the collective and the individual, etc. [Magnaghi 2000]. In the absence of negotiation the uncertainties and risks intrinsic to an urban project turn into a source of inertia, a restraint to innovation and decision-making [Callon et al. 2001].



**Figure 1: The MR Tent is a portable lab for using Mixed Reality in urban planning on location**

Traditionally, urban design is facilitated through the use of non-participatory media, which allow urban planners express and explore their design concept, as well as to carry out complex tasks, through various means of representation and simulation (CADD, parametric design, photorealism, animation, etc). While these tools add to the possibilities of urban planners of explaining and envisioning, their communicational aspect, which is so crucial to urban projects, is quite limited.

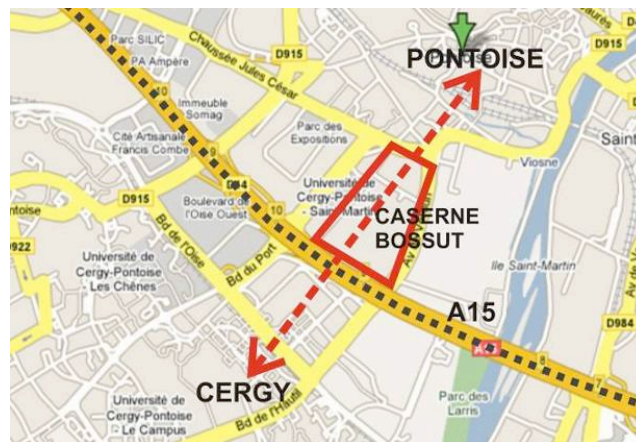
We have developed a prototype of an integrated framework of tools, an MR application supporting a range of devices for collaborative multimodal interaction and individual expression. These tools allow groups of stakeholders in an urban project create and manipulate visual and auditory scenes, and mesh these scenes with the real environment of an urban planning site as an integral part of expressing and experiencing an evolving project. The technical infrastructure is housed in a specifically designed *MR Tent* (Figure 1), which allows bringing technologies that are normally available only in laboratory settings to the site of an urban project. On top of designing these tools in a user-centered design process, we have also developed an approach to supporting multiple interactions among the various agents (professionals, as well as lay people, referring to different temporal and spatial scales, representing various cultures) in real complex urban environments. We contend that when introducing participatory technologies, methods are needed that facilitate the constitution of multidisciplinary teams founded on public-private and local actors-global operators partnerships [Bourdin et al. 2006].

In 1991 Lave and Wenger introduced the now widely used concept of ‘Communities of Practice’ (COP) – ‘groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly’ [Wenger et al. 2002]). Members of a COP share resources, experiences, stories, tools, and ways of addressing recurrent problems. We argue in this paper *that a prime goal of participatory technologies is to help build and sustain a COP*. Of the ‘seven principles for cultivating’ COPs put forward by Wenger et al. [20] we find four particularly useful for thinking about the context of urban planning: ‘different levels of participation’; ‘open a dialogue between inside and outside perspectives’; ‘focus on value’; and ‘combine familiarity and excitement’. We will take up and reinterpret these four principles in the discussion.

We start by describing the urban project we selected as the site for the most recent of (up to now five) participatory workshops with users. We then proceed to demonstrate how the use of the MR-Tent and tools is (and has to be) embedded in a process of a) identifying a project, site, and the urban issues at stake; b) enabling participants to create a vision of the project-to-be; c) preparing scenarios as well as visual and audio content. After presenting the MR-Tent technologies we describe participants’ interactions and negotiations on site. In the focus of this analysis will be the role of space and materials for participants’ collaboration, as well as the relevance of different types of content (3D, 2D, sound) for how they address the urban issues at stake. The discussion addresses the question of how participatory technologies and events, such as the workshop we describe, may help build a COP around an urban project.

## 2. The urban project

The most recent participatory workshop was organized within the context of the urban planning project of the *Caserne Bossut* in the city of Pontoise. The site was chosen in relation with the urban issues addressed by the Agglomeration Community of Cergy-Pontoise and the Planning and Urban Design Summer Workshops organized by the Ateliers with Cergy-Pontoise University.

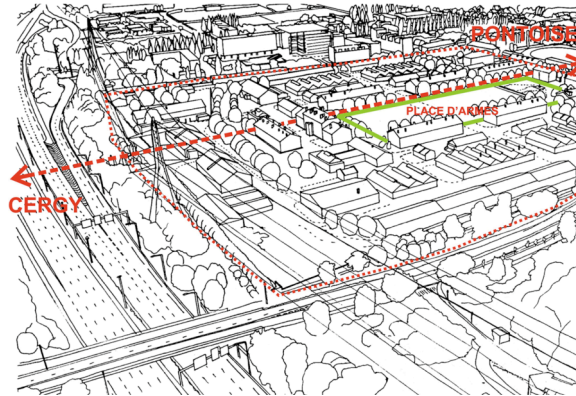


**Figure 2: Location of the site in Cergy-Pontoise**

The barracks of the *Caserne Bossut* (1914-1916) are nowadays a wasteland situated at the borders of highway A15 that crosses Cergy-Pontoise, one of the new towns created 40km away from Paris in the '60 (Figure 2). Since the facilities were no more used for military functions, the 13-hectare site was sold to the local authorities in the '90s. It is now owned by the Agglomeration Community under the municipal authority of the City of Pontoise. During the period 1999-2004 the site was handed over to the artistic association *Usines Ephémères* that transformed these, architecturally speaking, original military buildings into artists’ studios. Since 2005 the area is hosting a police department and is used as a training field by the fire brigade. The *Caserne Bossut* corresponds to the big mono-functional entities typical of the New Towns. Nearby there are other facilities with a similar introvert logic: the private school Saint-Martin and Cergy-Pontoise University. However, since the casern was not open to public life, it is perceived as a sort of huge hole in the urban texture. Being owned by military services for almost a century the site was not affected by evolutions, and in particular by the creation of the New Town. This time gap can be taken as an opportunity to reflect on urban issues calling out to artistic creation. This is one of the reasons why the experience with *Usines Ephémères* was particularly interesting. It was also the only period when

the site was somehow integrated into the ordinary urban texture and it is nowadays one of the last large land reserves in the city of Pontoise.

A development plan was prepared for the area under the guidance of the Agglomeration Community. It anticipates the construction of 2000 housing units and the development of a commercial zone including a convention and exposition center. The future district *Bossut* will also be equipped with a school and a childcare center. The new constructions will be replacing 90% of the existing buildings but the streets will be conserved. The *Place d'Armes*, the central open space, will become a major public space and a place of animation.



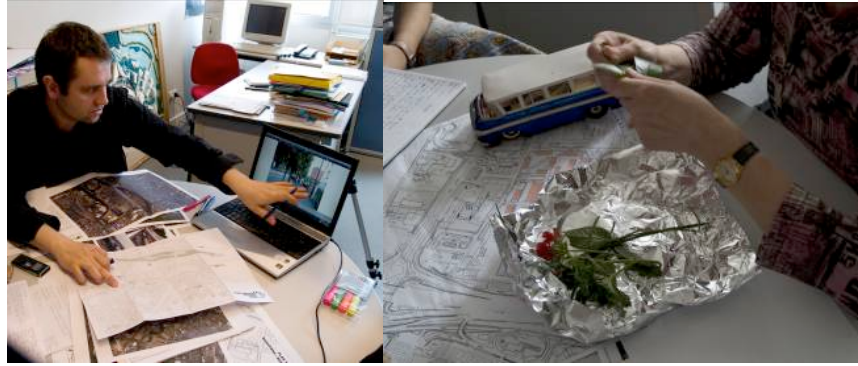
**Figure 3: Urban issues for the Bossut district (image from Guegeuen [8], p. 25)**

The main urban stakes concern different scales and the point of view of several stakeholders. The City of Pontoise, for instance, is careful about local effects (the nearby residents, the relation of a historic town such as Pontoise to the modern centre of Cergy, etc.), while the Agglomeration Community has both the point of view of the owner, responsible for the site itself, and a larger vision due to its metropolitan competence. In this perspective, an important urban issue concerns the identity and the uses of the site: will it be a transit space with vivid activities or a place for rest and leisure? Therefore connections and public transportation are very important elements: the site is at equal distance from the two main train stations of Cergy-Préfecture and Pontoise (400m), so the possibility of creating a new centrality has to be discussed (Figure 3). Moreover, the highway A15 acts as a border at the moment: another element for the discussion is the possibility and the way of crossing it. Should it be a bridge or an underway path? Where? For pedestrians or also for cars? Technical constraints, such as the levels of the ground on the two sides and the presence of high voltage electricity pillars, must also be taken into consideration. With respect to the main urban planning issues, it was decided to organize two urban scenarios: the first one focalizing on the central public space and the second one on the issues related to the residential area and the streetscapes.

### **3. Engaging and preparing the participants**

Different types of stakeholders were selected and consented to participate in the workshop - urban planners and specialists, members of the municipality, including the director of planning, as well as representatives of the local community. These were two members of theater companies that had used the site together with other artists before the municipality had closed it, a policeman from the local police station, two members of an association representing pedestrians and cyclists, two representatives of commerce, and a student from the nearby university.

In July 2008 we invited all prospective participants to the site to distribute a cultural probes package [Gaver et al. 1999] to them. This was also an occasion for them to visit the site itself, which few of them knew and some had not even been aware of. We used the cultural probes method in combination with a narrative interview technique (the interviews were conducted a few days later) for stimulating participants' imagination and to help them prepare for the urban planning workshop. The cultural probes consisted of two maps of the site (and surrounding area) of different scale, three panorama pictures, and a CD with 99 sound files to select from. Participants were asked to think about connectivity, about the central public space, and also about housing types and activities they would like to see at *Caserne Bossut*; as well as collect and bring objects with which to represent their ideas.



**Figure 4: Using cultural probes for creating a vision of the site**

Participants brought printouts of Google Earth maps, reference images, pictures from a walk around the site (Figure 4 left), as well as small objects with them. They annotated the maps and told their stories of the site and its connections. Themes, such as the relationship of the site to nature, connecting to the nearby river Oise, building a bridge across the highway, constructing a lively city centre with lots of small shops and restaurants, etc. emerged. The theatre person, for example, brought tools and metaphors from drama with him, including a poem by Rimbaud, which he recited, as describing the ambience of the site-to-be. A non-seeing participant not only gave us ideas on how to annotate map and tokens so that she could more easily interact; she also brought some flowers with a fine perfume from her garden along (Figure 4 right). The specialist for water and environmental risks explained his idea of 'ecovillage' using a series of images of complex water systems.

From the visions participants created in the 'participatory interview', we extracted two scenarios, as well as visual and sound content. Figure 5 shows two of the numerous 'content cards' we created for participants to select from. In addition, we prepared four photographic panoramas of the site from different viewpoints and two physical maps of different scale (1:500, 1:1000) to be placed on the ColorTable (Figure 6).



**Figure 5: Content cards with image, barcode, and information on associated sound files – R (realistic), A (artificial)**

The importance of these extensive preparations, not only for the lay people but also for the planning experts, was confirmed during the workshop itself. Participants arrived with their knowledge of the site, their own vision of the kind of interventions they would like to explore, and they found the content they needed for entering the debate.

The workshop started on Sep 10, 2008 with a two-hour training session with the non-seeing participant for whom we had annotated the map of the site as well as the tokens and 'command tablets' in Braille, as well as a demo session for interested people from the municipality and an architectural summer school. The next two days were spent with two different participant groups, starting in the morning with a tutorial after which the group built their vision of the site, and ending with a feedback and debriefing session. Participants also filled in a small questionnaire with free comments on a range of key research issues. The workshop ended with an additional demo session on Sep 14. All sessions were moderated by one of the urban specialists of the team and supported by the

developers. They were videotaped. In addition we took pictures, focusing on participants' interactions both, with the technologies and with each other, and saved relevant scenes.

#### 4. The MR-Tent

The MR (Mixed reality) tent is a novel concept developed in the IPCity project: a mobile urban design laboratory which can be transported to a site of design and where real city scenes can be interactively augmented with computer-generated visualisations to illustrate, debate and experiment different design possibilities between various stakeholders of design (Maquil et al. 2007, 2008). The technical infrastructure (Figure 6 top) is set up outdoors in the MR Tent on the site of the urban project. The MR Tent provides shelter for workshop participants and equipment while its adjustable openings give view to the surrounding side. Inside the MR Tent, two large screens show perspective views of the urban site. The views are alternatively fed by a live video stream from a remote controlled camera, a panorama image prepared previously, a direct view seen through a half transparent screen.

The round table in the centre of the MR tent is a multi-user tabletop in support of urban planners and diverse stakeholders collaboratively envisioning urban change. It provides users with the possibility to arrange and position tokens on a surface, representing a 3D scene. A tabletop projection augments the surface of the table by a map, which provides a bird's eye view of the site. A vertical projection renders the scene against a background, which is produced by either a real time video stream, a panorama image of a site or a see-through installation. Objects of the mixed-reality world can be modified and adapted in scale, transparency, colour, and offset to the ground. Users can define land use, add roads and flows to a scene and create and explore the soundscape connected with the visual scene. They can also sketch on the scene, on multiple layers or 3D objects, applying paint and textures. The set-up is truly collaborative; it supports simultaneous interaction in building a scene, but also revisiting and reworking previous scenes in a cooperative way.



**Figure 6: The technical setup inside the MR Tent is centered around the two projection walls and the ColorTable; representation of a scene on the physical map (right)**

#### 5. Co-constructing a vision of the site

To give a flavor of participants' interactions we focus on one of the two key sessions with six participants (architect, specialist for water and environmental risk, policeman, student, representative of commerce). During the morning tutorial the group had quickly appropriated the MR technologies. After that they decided on the questions they wanted to focus on: how to connect the site with the two towns, the university and the river Oise; how the centrality of the site should be defined; and what kinds of housing and activities to envision.

As soon as participants had assembled around the table, they started explaining the site and its environment to each other, with the policeman (P), who is stationed on site, describing his view. There was an animated discussion and the group decided to start setting paths, beginning with the 'transversal' ones (Figure 7 left). They first checked all the tokens they needed and placed them on the edge of the table. Road setting was done in a

cooperative way, first on the map 1:500, and embedded in an intense discussion of the territory, issues of access, and the central axis. Each step was checked if everybody agreed. Participants tried to exactly position three parallel roads (50km type). The next step was to set ‘flows’, step by step (Figure 7 right), looking at them from ‘the blue tower’ panorama. This involved a debate about the kinds of traffic to invite and how this would affect the site. They also set a path for pedestrians and cyclists along the main axis. E (the responsible for commerce) suggested placing a bridge across the highway (large enough to also allow a small bus to cross) and a bus stop nearby. A blue arch appeared in the panorama taken from the roof of the nearby university. After that participants examined the area close to the Oise, with again P explaining, and E engaging in a long conversation about this area, the travelling people who live there, and they finally decided to set a pedestrian path from the site to the Oise.



**Figure 7: Setting flows (left); Flows and one family houses as seen against video stream of site (right)**

The next scenes are to do with participants selecting and placing buildings. They first looked at different types of residential buildings placed on the whiteboard, later they also added images representing ambiances (e.g. streetscapes, facades) and scenes (e.g. children playing). They discussed all the time, taking an image, placing it back, sometimes all together, sometimes two of them. At one point, JM (from the municipality) took over and placed the cards in front of him on the table. He started by presenting an idea and all the others joined. There was a moment of vivid simultaneous pointing and explaining. They created a row of 3D buildings close to the viewpoint of the panorama – the blocks looked gigantic and the participants rearranged them and placed another row symmetrically. E lifted up a card as a reminder – these are one-family houses, which they arranged in the corner left to the entrance. They also added a texture to cover the ground. You could see the houses along a ‘real’ path (in the panorama).



**Figure 8: Rows of housing blocks in panorama with image of library denoting use**

Someone had placed the image of a library just in front of the first house to denote use (Figure 8). You could also see the pedestrian path crossing. Participants now really started ‘filling’ the scene. They also worked more on details, like G and E, who discussed the corner left of the entrance, with G mentioning that there should be more housing and he also pointed out paths and vistas from this point into the central place.



## 6. Discussion

How can MR tools and events, such as the workshop we described, help build a COP around an urban project? We here take up some of the principles for cultivating COPs put forward by Wenger et al. [20], reinterpreting them from the point of view of a COP's long-term engagement in an urban project.

**(Different levels of) participation:** The first aspect concerns the participatory potential of the MR-Tent. One of its main strengths is that it brings people together around a table and provides them with tools that are easy to learn and handle in an interactive way so that they can quickly develop a good way of working together. The table acts as a mediator insofar as participants do not have to discuss in a confrontational way face-to-face but by means of gesturing, setting interventions, commenting, and modifying. This is an inclusive mode, which does not favor the expert. It leaves space for everybody.

The MR-Tent provides a space for 'mixing realities' that can be viewed and evaluated together. The diversity of perspectives as well as the presence on the site enlarge this interaction space, hence also the means of expressing and experiencing. People point to the panorama view, they cluster in front of the see-through, they look for content, they zoom into the video-augmentation, they may even step out of the tent to look around.

Our focus on participation had strongly influenced our design decisions, namely to build a tangible user interface in combination with color tracking, to create a 2.5D interaction space, and to support 'immediacy' - the ad-hoc creation of mixed reality scenes as an integral part of participants' expressing and experiencing ideas - rather than perfect renderings. Erickson [1995] stresses the 'roughness' of design representations that leave openings for discussion. However, the MR-Tent is not a tool for 'ad-hoc' participation. Participants need to prepare for the workshop so that they arrive with a vision and issues to address (see our 'cultural probes interviews'). They want to bring their own content or find content that helps them express their ideas. Preparing content (3D, 2D, sound) requires special expertise, including artistic skills. The main challenge here is to select and edit content that allows represent urban issues in ways professionals but also lay people can relate to.



Figure 9: Collage of activities and buildings

**Open a dialogue between inside and outside perspectives:** The non-expert participants that were invited clearly represent perspectives that are traditionally kept 'outside' or at best at the margins of an urban project. The 'cultural probes interviews', as well as the round table were our main instruments for helping them enter into a dialogue with those 'inside'. Crucial to this was the fact that the technologies we provide are relatively open. We did not implement any 'rules' or 'constraints' beyond the technical limitations of the tools, and with this made an explicit step away from simulation tools. This moved decisions away from the technology into the responsibility of the participants. The floor was theirs with regard to the actions they wanted to set and the level of complexity they wanted to address. We had in a previous workshop [Basile et al. 2008] experimented with a set of urban rules concerning the urban density, such as the spacing of volumes of different sizes and heights or the reachability of central places. We observed how this quite simple set of rules turned the MR-Tent into a teaching tool (with the

specific benefit of letting participants better understand the implications of some interventions) rather than a tool for an open dialogue.

**Focus on value:** From an urban planning point of view, the MR-Tent lends itself more to developing a general strategy for a site, discussing main interventions and ambiances. The results of such sessions can be taken back to the design office for specialists to detail the design, eventually returning to the Tent for presenting, discussing, and taking up additional comments.

A particular value of the MR-Tent lies in the fact that urban planners have the chance to find themselves on ‘equal footing’ with non-experts. This implies that they need to give up control over how to represent urban issues. Essential for urban planners is, for example, to correctly visualize the volume, scale, and position of objects. The video view onto the scene offers no depth information; and in the panorama view an approximation is created by occlusion based on a depth image. We observed that participants partially compensated for these imperfections on the one hand; that they sized and arranged objects ‘optically’ in the panorama in relation to other objects on the other hand. 2D objects may not work so well spatially but they have a strong expressional value. The composed scenes (including the screenshots we printed out for participants to further discuss) are rather different from the material architects are used to work with, in terms of perspective, as well as mixture of real elements with 3D objects and 2D images. Also working with sound as a predominantly expressive medium requires learning on the side of urban planners. We contend that the value of the MR-Tent is precisely that it opens up for novel forms of representation beyond widely accepted representational techniques, such as sketching, 3D modeling, and simulation. These novel forms play a crucial role in the intended dialogue between inside and outside.



**Figure 10: Scene with 3D buildings seen from above (top) and 2D images visualizing use and detail**

**Combine familiarity and excitement:** Many aspects of the MR-Tent are based on familiarity: the meeting place of a tent, the experience of a round table, physical maps, the simple objects made from well-known material we provide, as well as interaction modes participants know from everyday life. Participants could even recognize a part of the content as ‘theirs’. At the same time, we use these elements in a somewhat unusual way. Participants are invited to not just talk about their vision but to enact it; in fact the action temporarily moves to the foreground and the talking to the background. They engage in a mixing of realities, which is new to them: composing a scene on the physical map with physical objects while feedback in the form of footprints is projected on the table; seeing the same scene presented in different perspectives – panoramas taken from different viewpoints, real video stream, or see-through; being exposed to a soundscape that changes with each object they place and with the hearing position. We may even look at performing *in situ* as an unusual experience.

## 7. Conclusions

The MR-Tent as a mobile in situ laboratory has been designed to shelter a community gathered around a common project. As a shelter, the Tent contains all archetypes of a place where the members of a community bounded to a

common activity can meet, get to know each other, exchange, and decide in an equal feeling of wellbeing. Its envelope reminds the original nomad dwelling, giving participants the pleasant and enjoyable impression of an exceptional meeting. The round table in the middle of the Tent is typically the place where a community meets and exchanges ideas, values and perhaps friendship. Because, as Antoine de Saint-Exupéry says (*Terre des hommes*, 1938), «Aimer, ce n'est pas se regarder l'un l'autre, c'est regarder ensemble dans la même direction» (Love is not looking at each other, it is looking in the same direction [our translation]). The window opening to the neighboring landscape metaphorically describes the research collective's view onto the world and the ambition to understand it. Like a city or a house, the Tent is a place that stimulates the desire to be together and invites a common decision; a place where people can meet, discover and appropriate a world; in other words live together inside a complex and sometime contradictory community

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