Exploring Urban Experimental Lab for public participation and education in urban design

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Abstract. This paper deals with visual digital collaborative tools for public participation in urban design. First it addresses the problem of the diversity of skills and knowledge levels of all the actors involved. The main focus is on exploring Urban Experimental Lab (Voigt, Kieferle, Wossner, 2009), developed for public participation in urban design, shifting the research focus towards the questions of educating both lay and different professional public through this process. Public participation in urban design is seen as an opportunity for lifelong urban design learning, offering a wide variety of different actions, problems and educational elements. All the participants are expected to improve their knowledge levels through participating in design process.

Keywords. Digital collaborative tool, urban experimental lab, public participation, education, urban design.

INTRODUCTION

Public participation in urban design
Public participation is a collaborative activity; different participants (experts and lay public) should come together, communicate, exchange their ideas, and develop common urban visions. Traditional participation has moved towards its virtual alternative, where participants do not need to share their physical space together at the same time (no time or place limitations). The main focus of this article is to explore the ways of presenting the digital city model, so it would be suitable for everyone, for lay public on one side and experts on another.

Schoenwandt (2008) defines “third generation” planning theory as next step to the rational model of planning, where “agents” of planning construct a “planning world” (experts/ professional public), which exists in the context of an everyday “life-world” (lay public). There a specific exchange among both “worlds” always happens: “Comprehension of the Situation”, “Elaboration of Instructions”, “Communication about Behavior”, “Interventions”, “Settings”, and “Outcomes”. The collaboration could be seen as an opportunity on the interface of “the
planning world” and “the life-world”. The “object” of collaboration process could be real or virtual, different according to the space and time; i.e. real world or digital representation of the real world vs. digital city models to be used for simulating a potential future or even the past.

There is a specific need for public participation at the beginning of planning and design processes (understanding the problem) and at various decision stages (e.g. design-decision-support; deciding how to further proceed) as these situations are specific meeting points between “the planning world” and “the everyday life-world” (Schoenwandt, 2008).

Urban design is a collective public activity; through combining designers’ ideas, possibilities and community choices and through making decisions the stakeholders are trying to achieve better final solutions. Changes in the environment should bring people towards better living and working conditions. Therefore participants should be invited into the decision making process. As Yu Dazhong states, “the participatory process in urban design should be seen as a process of enabling participants to participate in decision making through an effective involvement” (Dazhong, 1999). As a consequence to the rapid development of digital technology and cyberspace we can also talk about using visual digital collaborative tools for the purpose of designing/presenting urban design projects. Urban design is actually also a virtually based activity, where the main communication language is a visual and not a written one. Moreover, nowadays digital tools for urban design are more or less used only for communication between different participants and not for an active collaboration; the final design seems more important than the whole process.

This paper deals with visual digital collaborative tools for public participation in urban design. First it addresses the problem of the diversity of skills and knowledge levels of all the actors involved. The article addresses the issues related to the exploration of digital city models (Jutraž, Zupančič, 2010), and focuses on the specific offer of the Urban Experimental Lab (Voigt, Kieferle, Wössner, 2009), developed for public participation in urban design. It shifts the research focus towards the questions of educating both lay and different professional public through this process. Public participation in urban design is seen as an opportunity for lifelong urban design learning, offering a wide variety of different actions, problems and educational elements. All the participants are expected to improve their knowledge levels through participating in the design process.

3D city model and various views

Digital 3D city models are not always understandable to lay public as the point of view is usually not the same as the one you are experiencing by walking through the city. Some of these models are already used for public participation; they enable shifting between different views [1]; others are presented as simulations, though trying to present the city with a high level of realistic details [2]. Some 3D city models are made too abstract, they are difficult to navigate, making it difficult for lay public to connect them with the real city, and consequently they are unsuitable for public participation [3]. Our idea is to have a digital model easy to understand and navigate, which can be used in different stages of the design process, thus connecting those stages into a new wholeness of critical, creative and realistic participatory discussions of all the actors involved.

Urban design is made for people, therefore their perception of the space or the living environment and experiencing the site are very important and should be taken into account in the preparation and the use of digital city models. Lay public is used to the view of walking through the city; therefore they should be enabled to experience new urban design, new city development or any new changes as best as they can by the same view (pedestrian view), to compare it most effectively to the existing situations. However, thanks to the rapid development of the Google Map/Earth and other 3D models people are becoming more and more used to the bird view. The aim of this research is to find the importance of each
view and the difference between how people experience the space if they observe the location from different points of view where only the elevation from the ground is changed (from 1.6 m to 10 m or to 30 m) and the position (x and y value of the view) is kept the same. The appropriate use and combination of experiential and conceptual means of presentation in communicating accurate information about spatial environments between the lay and the professional public have already been defined (Mullins, Zupancic, Juvancic, 2002); our research will focus on presentation of 3D city models so they are understandable to lay public.

Towards “distributed labs”
The research directs us towards a “distributed lab” (combination of different labs, distributed across numerous physical or even geographical locations). The first one (“street lab”) is non-physically defined, movable, the moderator of the participation process professional or lay public questions (interviews made in London); the second lab is located in Vienna, users have to go to the Urban experimental Lab (later: Lab); the next stage is a virtual one, located on internet, accessible to everyone (“virtual lab”). The benefits of all labs should be combined in order to enhance the “virtual urban lab” for public participation.

“Virtual labs” should be used as urban co-design interfaces for public participation in urban design, they should offer a two-way communication and collaboration between the lay public (“life-world”) and the professional public (“planning people”) from the first stage of the planning process through the whole design - decision-making process.

Urban Experimental Lab (later: Lab) represents twenty years of researching digital cities to support urban planning, dealing with real time interactive simulations, decision-making processes, urban reconstruction and urban archeology, etc. The Lab is located at Vienna University of Technology; it is consisted of two adjacent seminar rooms, divided with flexible big projection screen. In the “projection room” there is an active stereo projector attached to the ceiling. VR-simulation environment enables visualization, simple walk-through, direct interaction with the models, visualization of semantic information, interactive simulations, etc. Its desired research field is urban planning. It enables the exchange of urban visions between lay public and experts, their presentation and exploration supported by digital models (3D and 4D models) and simulations. So far mostly urban planning researches have been carried out in the Lab, but there is an opportunity of combining urban planning and urban design for public participation seen in the project.

Lifelong learning through public participation
Lay public lacks both the knowledge and skills of urban design. On the other hand, the professional public lacks the knowledge of public participation. Thus all the actors or stakeholders could and should benefit from the lifelong learning of the participatory urban design. Lack of knowledge and understanding of presented digital models often leads to resistance to any change, even when it could bring a higher quality of the living environment.

We wanted to find out how we could simultaneously involve lay public and experts in designing their urban space. We were thinking about involving them in exchanging or more likely creating urban visions, in walking through new urban designs, in giving comments, etc. Experts can exchange more alternatives with lay public and they can also give them the possibility to create their own urban vision with appropriate digital support tools. The options of real time interactive simulation have already been tried by using a touch table (MS surface) in the Lab: it was used as an interface - a physical urban model was made of building blocks that were placed on a plan of the area and the positions of these blocks were directly adjusted to the computational model on the screen. When you moved a block physically, it was simultaneously moved in the digital model on the screen.
RESEARCH
The main purpose of the presented research in this article is to explore the possibilities of improving communication and collaboration between lay public and experts in the urban design process as an opportunity of lifelong learning. This is part of a research of digital tools in the participation process; the main aim is to find out what kind of digital city model is the most suitable for this process, to define which view is the most understandable for lay public and to define the role of the 3D city model in the whole process of public participation. Furthermore, we are exploring the possibilities of using a digital city model within a real participatory process.

We assume that:
• Specific information about the city can be gained just from the specific view (pedestrian, intermediate/mid-, bird), none of these views is a replacement for the other in the process of visual communication in public participation. It is clear that the larger scale of the conceptual urban changes can be detected from the bird view and experienced from the pedestrian view, but it is not absolutely clear what happens with smaller scale urban interventions in terms of their recognition from different views. That is why special attention was drawn to the small-scale urban proposal. The scale of the proposal can be defined in relation not only to the scale of the urban wholeness, but for the purpose of the present research also to the pedestrian view reference - its experiential observer and his cognitive limitations.
• From the pedestrian view and its experiential mode you can identify (and immerse into) urban elements and their spatial characteristics and you can explore the experiential effects of an urban proposals of any scale.
• The mid-view, which is neither experiential nor fully conceptual, is the best opportunity to shift from the pedestrian view to the bird view and vice versa; it is also useful for identifying the conceptual information about an urban design proposal of a smaller scale.
• From the bird view and its conceptual mode you can identify the presented city structure (and larger scale concepts).
• Presented 3D city model in the Urban Experimental Lab offers a higher level of experiential mode immersion than the model presented on the computer screen. This enhancement is most effective from the pedestrian view.
• The interaction between the actors of the process of public participation is an opportunity for a lifelong learning.

This article presents an initial phase of the entire research of digital collaborative tools; in the first phase 3D city models are explored and in the next one their application to the participation process in urban design will be made.

Methodological frame
The research was made in June 2011, and was divided into 3 phases: (1) designing a digital 3D city model, (2) testing the digital 3D city model presented on the screen, (3) testing the digital model in the Urban Experimental Lab. A city model combined by a questionnaire was used as a base for interviews, which were held in Ljubljana and London, with 20 people in each city.

As the main aim of research was to find out how people understand digital city models, how readable they are, how they can understand the city by looking at its 3D model and not from their previous knowledge about the city, and how they can experience the changes proposed. We wanted to exclude the influence of knowing the presented city, which is why the interviews were made in London, where none of the people involved knew Ljubljana and had never been there before. The people were chosen randomly; they were residents of London and tourists from Europe and US of different professions (none of them was an urban designer, architect,
landscape architect or any other profession used to the visual presentations), different ages (from 25 to 60 years), women and men. By asking people who are living in Ljubljana and abroad the same question we wanted to exclude the possibility of getting answers based on their previous experiences and not on the presented 3D city model.

Ljubljana was chosen for the process of testing the digital city model, more exactly, the inner part of the city around the hill. Each participant spent approximately 30 minutes on the survey – the digital model was shown to them, they were questioned about the model and their opinions on different views. We shifted the presentation from the bird view through the mid-view (defined at 10 meters elevation from the ground) to the pedestrian view or vice versa (to the half of the participants first the bird view was shown and then the mid- and the pedestrian view, to the others first the pedestrian view was shown). We defined and tested three views with different elevations from the city level: 1.6 m (pedestrian view), 10 m (intermediate view, later mid-view) and 50 m (bird view), where we changed just elevation level from the ground and kept the x and y values. The observation distance of the first two cases was comparable in order to check the actual real-life pedestrian experiential situation and the situation often used in digital model observations, which can be defined as a “virtual experiential” observation mode. However, the distance of the third case was increased to enable a higher level of special conceptualization, close to conceptual (axonometric, for example) presentations.

We checked the meaning of each view to the participants and how the information gained from different view sequences could be complemented and could form together the whole image of the city. Through the discussions with the people involved we found out their level of understanding of the digital city model through its presentations and the level of their visual communication skills.

The research of the digital city model was combined of two parts:
• the 3D city model was tested on the computer screen and
• the 3D city model was tested in the Urban Experimental Lab (later: Lab).

In both cases the experiential and conceptual mode of the city was presented. By presenting the 3D city model on the computer screen it was shown as video clips and in the Lab the moderator walked participants through the model or even let them navigate and explore the city on their own. The Lab also offers the option of exploring the 3D city model with 3D glasses and we predict that this enables a better experiential mode.

Through the interview based survey we wanted to answer the following questions in order to find out which view is the most suitable for presenting a 3D city model to the lay public:
• Are people able to identify the presented city from the usage of the 3D city model? Which elements or characteristics of space (natural features, build structure, etc.) are most helpful for the identification and which view is most appropriate for the visual communication?
• Are people able to identify the urban elements and their spatial characteristics (e.g. height

![Figure 1](Bird view, intermediate (mid-) view, pedestrian view)
of the buildings, enclosure of the street, etc.) from the 3D city model used and which view is most appropriate for it?

**Results**
The interviewed people explore the 3D city model, and compare the different views - which view is the best for public participation, from which one you can get most of the information and what is the nature of the information acquired.

We compared different views on the basis of the following categories: identification of the presented city structure, identification of urban elements and their spatial characteristics, and urban design proposal. Some of them were measurable (measuring tool was scale level from 0 to 9, 0 as minimum and 9 as maximum) others were compared on the descriptive basis (interview, discussions).

**a. Identification of the presented city structure**
Two groups of people were tested; first one (interviewed in Ljubljana) identified the city easily because they were used to the city, they really knew it. Most of them recognized the city from bird view - the dominant elements such as the hill with the castle and the river helped them. From the mid- and pedestrian view only a few people recognized it (because of some dominants like higher buildings and parks), others failed. The second group of people (interviewed in London), were, of course, not able to recognize the city (all interviewed people had never been in Ljubljana before).

All the people from the first group (interviewed in Ljubljana) recognized the city and its building structure easily also from the bigger distance from the 2D Google Map view. The second group (interviewed in London) had more problems: 90% of people recognized the natural features like the hill and river on the 2D Google Map and they linked the 3D city model with the correct 2D Google Map (we show them the Google Map of Zürich, Vienna and Ljubljana). The linkage was not possible after the pedestrian and bird-view observation but after the bird-view observation only.

**b. Identification of urban elements and their spatial characteristics**
Height of the dominant building (we asked them for the specific building in the 3D city model, see Figure 2) was measured in meters. Only three people were able to define the real height (+-2m) from bird view, others defined the real height (+-2m) in pedestrian and mid-view.

**c. Urban experimental lab**
The difference of the digital city model presentations on the computer screen and in the Lab can be described in terms of experiencing the space - all participants gained the same information about the city (in both cases the conceptual and experiential mode were presented) and were shown street and new design, however the ones in the Lab were able to walk as pedestrians on the shown street and were really able to experience it. The participants walking through the space in the Lab gained experiential information about the space faster and they were more able to connect part of the city with the entirety.

**DISCUSSION**
The interviews were based on discussions with lay public in face-to-face communication, where some extra information was gained, e.g. by recognizing

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*Figure 2*
Identification of the height of specific building (dark building) from different views (bird, mid- and pedestrian view)
the building structure and its geometry helped a lot the natural features like the hill and the river; there were shown some details as cars, trees and people in the model, which helped them by defining the real height of asked building – they compared known dimensions with unknown ones.

Though used in many “immersive” virtual realities instead of the pedestrian view, the mid-view is far from a replacement of the pedestrian view. It offers the opportunity to shift from the pedestrian view to the bird view and vice versa, and, in the cases of observers’ better visual communication abilities, it offers an insight to the connections between the part observed and the wholeness of the urban structure. It can be used as a kind of an interface between the pedestrian and the bird view. The observation distance allows you to observe the urban details, but the elevation helps you to shift into the conceptual mode of the city structure observations.

- The wholeness of the city structure and exploring of the city concept could be presented the best from the bird view.
- The pedestrian view is the best to explore the experience of the chosen site as people are most used to their daily view, when they walk through the city.
- The small-scale urban design proposal should be presented from both the mid- and the pedestrian view, as one can see completely different spatial characteristics from each of them.

None of the views is the best or the worst in terms of their overall communication effectiveness, as they differ in the mode of communication and thus the information communicated. It can be assumed that the highest level of understanding the city and the interventions proposed can be achieved by the combination of all three views, shifting from one to another when needed. All three views are needed and cannot be replaced with the other as they are offering different information.

Since the mid-view is by no means a replacement to the pedestrian view, the results of the interviews confirmed the need to explore opportunities for establishing presentations in experimental mode of large-scale urban interventions.

However, during the process of interviewing people we detected an important difficulty in all the cases where people were not directly engaged in the problem discussed - that is the problem of motivating people to come to the Lab; it was easier to approach them with the model on the computer screen.

The value of the Lab can be seen in the enhancement of the real time pedestrian view; there is seen also the value for the shift from planning to design issues and its importance for the participation process.

Moreover, general conclusions could not be made from the presented results as the number of interviewed people was too low. The future work will present the research with a better statistical sample.

**CONCLUSION**

**Shifting between different views**

The most suitable way to present the city model is to present the site from different views: the pedestrian...
view, the mid-view and the bird view. Things that are observable from one view are not seen from another. Shifting between different views can even improve the final results of the participation process. It is really important to shift from the entirety to the detail in both directions, and from the conceptual to the experiential mode of presentation. Mid-view can be seen as an interface between pedestrian and bird view.

**Lifelong learning**

After interviewing people we can conclude that a direct verbal communication with the lay public is really effective and important for the public participation process. After long discussions with the interviewed lay public we found out that the level of their knowledge increased rapidly. The communication process is seen as an important issue for both, professional and lay public, as they can both learn something new. Therefore the public participation in urban design through using digital communication and collaborative tools can be seen as a lifelong learning process. Moreover, we can define labs as urban design learning environments. Labs should be seen as learning environments, where a shared urban vision could be developed through communication and collaboration. Both lay and professional public will participate in this process. The basic characteristics of labs should be: cross-disciplinary based; both for lay and professional public; knowledge transfer in all directions (between all participants, between different disciplines, from professional to lay public and vice versa); collaborative and communicative tools for public participation in urban design; easy to navigate in 3D city models; with easy to use tools for participants with different knowledge background.

There are some potential for future work observed: combine different labs; combine real and virtual worlds to enable public participation and learning with no time and place limits; enable tools for designing and exchanging opinions in 3D worlds and not just in written words. Through such a concept the knowledge transfer could be viewed in both directions - form professional to lay public (from “planning world” to “life-world”) and from lay to professional public (from “life-world” to “planning world”).

To conclude, the integration of urban planning with urban design is seen as one of the opportunities how to enhance lifelong learning. Through combining both uses, designing and planning, lay public and experts will increase their knowledge on specific topics and will finally be more satisfied with the end product. With development of digital tools we can also help to facilitate the identification of fragility in the urban environment and to develop the sensitivity of the people involved in this process.

**FUTURE WORK**

Our future work intentions include the engagement of different representatives of lay public and experts in the participation process, as each participant offers particular knowledge and/or expertise/visual communication ability that can be shared with others and each could learn something new from other participants. Our focus is actually lay people such as politicians, citizens, users and investors. Experts such as architects or landscape architects are more or less interpreted as their support (they have to propose some architectural/urban solutions); they all take part in this process to different extents, which are defined depending on the chosen problem. The interdisciplinary team should also involve environmental psychologists, urban sociologists, urban anthropologists, economists, etc. However lay public could learn a lot through the urban design participation, just by being there, sharing comments, opinions
collaboration is actually a more important process than only communication and can lead towards a lifelong learning of urban design.

Potentials of the Urban Experimental Lab are seen as an opportunity to move towards a “distributed lab” in public participation. Urban Experimental Lab offers by using 3D glasses real experiential mode, and by using it for the public participation process we can help stakeholders with the tool for decision-making process. Urban planning, which has already been explored in the Urban Experimental Lab, could be combined with urban design, as planning is always connected with designing and vice versa. Shifting between urban planning and urban design will be explored in the next stage of the research. Moreover, presenting just one view at the same time sometimes lead to the difficulties of navigation through the space and losing connection between entirety and details - if you walk as a pedestrian through an area you are slowly losing orientation and the opinions or critics of an urban design proposal may not be relevant at all (e.g. urban design proposal can be perceived well if it is seen from the pedestrian view and not well from the bird view, so one has to check both views, shifting between them). The level of detail and complexity of the presented model will be explored in the next phase (how different levels of detail influence the experience of the space of lay people or “planning people” and how it is related to switch between bird and pedestrian view). More views (pedestrian, mid- and bird view) should be presented at the same time to offer a real-life experience, so you can synchronically see the urban design proposal from different views (pedestrian, mid- and bird view). The views should be defined in advance, on the location where changes were made and which are relevant for the public. Next step could include the working-by-doing concept where professionals give to the lay public the opportunity of designing on their own.

Future work is also seen in the changing of the scale level and extent of urban intervention at the same time, increasing a small-scale urban intervention to a large-scale intervention gradually or step by step. Moreover future development of “virtual labs” should support modelling and simulation techniques, modelling and simulation on various scales, simulation different scenarios and variants, etc.

REFERENCES


