

# Public Deliberation in Municipal Planning: Supporting Action and Reflection with Mobile Technology

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## ABSTRACT

This paper reports on an exploratory participatory design process aimed at supporting citizen deliberation in municipal planning. It presents the main outcomes of this process in terms of selected prototypes and an approach to the use setting. We support and discuss different ways for citizens to act and reflect on proposed plans: in-situ, while physically close to the planning object, and ex-situ, when citizens are remote from this. The support of in-situ and ex-situ participation allows citizens to engage in continuous reflection-in and on-action as a collaborative activity with other citizens, hereby inspiring citizens to increase their democratic engagement.

## Keywords

Communities and e-governance, map-based discussion, geospatial annotation, public deliberation, reflection and action, situatedness, participatory design.

## INTRODUCTION

*“Peter is out on his weekly run in the forest when his mobile phone starts buzzing in his pocket. He takes it out and sees that it is a notification from the Mobile Democracy application. The notification tells Peter that there is a proposed change in the municipal plan nearby. He clicks on the notification to find a description of the plans to build a new wastewater plant at his current location. Peter does not think much of it, but clicks the ‘show me’ button. Pointing the phone at the designated building ground as if to take a picture, Peter sees a 3D model on top of what the camera is actually registering. Peter walks around the site looking at the model from different angles. It almost looks like the building is already there and it is much bigger than he had imagined. It gets him thinking. Annoyed, he switches to the discussion tab and sees that three other people have already commented. He switches to the image tab and takes a picture. He adds the comment ‘This beautiful forest would be ruined with a wastewater plant.’ The topic is automatically bookmarked, so he continues his run. Later that evening he checks Mobile Democracy again, this time using his desktop computer. He looks at his bookmarks to find the wastewater plant discussion. He sees that more citizens have*

*commented and a municipal planner has argued that a new wastewater plant is needed, because the old one is no longer sufficient. Peter realizes that he has some potential allies among the other commentators. He decides to write a more elaborate discussion comment, listing disadvantages of placing the plant there and arguing for better locations. After a couple of days, he is contacted by another citizen and they decide to team up and write a more elaborate proposal for the planning debate.”*

The above scenario describes the use of two interconnected prototypes developed in a case exploring public deliberation in municipal planning through mobile, location-aware technology. In this paper, we focus on the development of the two prototypes within the specific design case at hand. It soon became apparent that what was needed in order for citizens to fathom the implications of the municipal plan – an abstract and often opaque bureaucratic object – was more than just putting information *out there* for people to find. Research has shown that merely increasing the available amount of information about public policy does not lead to increased democratic engagement [21]. Information and communication technologies have played an important role in governments’ attempts to support civic engagement by providing information in more pertinent ways than simply making it publicly available. Web-technology and community participation has been addressed, e.g., by Schuler [18] in what he calls *civic intelligence*:

*“Information and communication technology has the potential to alter civic intelligence in ways that go far beyond the informational content of any particular message that is transmitted or received. This observation applies to any efforts at encouraging civic intelligence. It is in fact the central tenet of the design philosophy that would undergird civic intelligence.”* ([18], p. 62)

In their characterization of e-participation software in Italian municipalities, De Cindio and Peraboni [10] argue that the shared discussion space of citizens and municipal servants (e.g. municipal planners) should be understood as consisting of three elements: a community space, which raises trust between participants; a deliberation space, which supports the creation of shared positions and concerted efforts among citizens; and an information space, which supports the sharing of information. The proposed discussion spaces illustrate that there is more to civic en-

agement and dialogue than government simply providing citizens with information.

Rendering comprehensible the link between information and physical locations through geographic information systems (GIS) is one way of supporting the conceptualization of information, hereby aiming to achieve the transcendence of civic intelligence. However, although GIS provide strong tools for participation, the technology can only do so much when it comes to supporting citizens in comprehending the personal consequences of proposed changes in the physical world as is the case in municipal planning. As such, McCall [15] notes that more than 500 papers have been written on participation and GIS without solving what he refers to as the “*crisis of democracy*”. Although the explanation for this undoubtedly relates to more than choice of technology, there seems to be an unexplored potential in the introduction of the particular technology of location-aware smart phones to the realm of public participation. Location-aware technologies provide various new opportunities, especially in combination with maps (see e.g. [6]). However, their application to decision-making in local communities has, to our knowledge, not been explored thoroughly.

Supporting citizen deliberation in municipal planning essentially poses two main challenges: helping citizens understand and helping them take (preferably collaborative) action. These two challenges are indeed intertwined and interdependent as citizens’ understandings of proposed changes in the physical environment will change as they become engaged in the act of altering these changes. Here, location-aware smart phones have a potential in supporting the provision of rich information and supporting concrete actions while the citizen is *in-situ*. That is, while they are in the physical environment surrounding the object under discussion. In this paper we present a participatory design case exploring such a setting: Citizen involvement in the development and revision of municipal plans through mobile, location-aware technologies allowing for new ways of conceptualizing information through means of e.g. augmented reality, GIS and community discussions.

The developed exploratory prototypes combine a mobile facilitation of experiencing planning issues *in-situ* while supporting citizens in collaborating through community discussions and the creation of concrete complaints or proposals. This stands in contrast to most of the aforementioned examples of GIS-based support for decision-making, which are based on providing information on a map that citizens can access while sitting at home or in an office, i.e. *ex-situ*. That is, when they are physically distant from the environment of the object under discussion.

Our work has been inspired by the many initiatives that allow for citizens to report problems in their physical environment (graffiti, pot holes, broken lamps, etc.) to their municipality or government in order to have these fixed. However, our aims relate to facilitating planning and democratic acts, rather than one-way, location-based information

from citizens to the municipality. For examples, see Citizen Connect,<sup>1</sup> FixMyStreet<sup>2</sup> and SeeClickFix.<sup>3</sup>

In this paper we make use of the following structure: We present the empirical setting and the participatory design process. This is followed by an introduction to our theoretical framing and research before turning to the design of the main prototypes. We analyze and discuss the main challenges as regards the design process and use situations of citizen deliberation and map-based community discussions. Here, we focus on the notions of reflection and action with a vantage point in the empirically grounded design case of municipal planning. Lastly, we broaden our focus and briefly discuss perspectives and challenges of future research within the design space of *in-* and *ex-situ* participation through mobile technology.

### DESIGNING FOR MUNICIPAL PLAN REVISION

The Mobile Democracy case is part of the eGov+ project, which explores e-governance services and infrastructure. The pivotal idea of the project is to examine how citizens may be supported in engaging actively in the provision of public services of various sorts. Notably, we focus on the support of collaboration among citizens and between citizens and government. The overall purpose of the specific case presented in this paper is to explore the use of GIS and mobile technologies as a means of supporting user involvement through participatory design methods. We emphasize improved cooperation, communication, and democratic engagement within *in-situ* physical planning. The geographical setting of this case is the biggest, albeit most sparsely populated municipality in Denmark. The duration of the intervention was approximately one year.

We acknowledge that municipal planning pertains to the alignment of the incentives and priorities of the involved stakeholders. However, in this specific case we have had a citizen bias and thus have not focused on the negotiation and articulation work among the various stakeholders as such.

### Municipal Planning

Municipal planning consists of a multitude of simultaneous efforts of which the focus of this paper, municipal plans, is one. A new plan is created every 12 years and is continuously revised. The municipality is required by law to encourage and receive input from ministries, public and private institutions, commercial and non-profit organizations, as well as private citizens. The plan often describes, somewhat abstract, goals for the development of the municipality at hand. However, it is primarily a strategic document used for physical planning and as such spatial annotations are a key element. They serve as concrete links to the existing physical infrastructure. Hence, maps are central to the visualization of these links.

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<sup>1</sup><http://www.cityofboston.gov/doit/apps/citizensconnect.asp>

<sup>2</sup> <http://www.fixmystreet.com/>

<sup>3</sup> <http://www.seeclickfix.com/>

The initial focus of the case was the involved municipality's wish for more and, what they referred to as, "better qualified" complaints and proposals to municipal plans. The municipality has had little success in mobilizing citizens to participate in the municipal plan revision. Where representatives of the municipality wished to gain a better understanding of citizen involvement, it soon became apparent that the main concern of the already engaged citizens was to be heard by their municipality.

### The Design Process

In the tradition of the UTOPIA project and our background, the design process has been user-oriented and we have explored the use of participatory design methods [12]. Throughout the eGov+ project, we have worked with participatory design on the boundaries between professional users (such as caseworkers) and citizens [4, 5]. In this particular case, we identified and chose two primary user groups: citizens and municipal planners. Whereas planners are easily identified by employer and professional title, nearly all individuals living in a municipality can be categorized as citizens. Consequently, work went into identifying how citizens could be targeted beyond this obvious fact. We established contact with several organizations engaged in planning issues within their community. Ultimately, we engaged in a more thorough collaboration with two of these groups: a local interest group pertaining to a parish and an ad-hoc interest group that had come together due to a particular planning issue regarding the expropriation of a piece of land. Apart from citizens having prior experience with democratic engagement, we also worked with individual citizens of various age groups and backgrounds to counterbalance the democratically engaged citizens in the two interest groups.

We considered two aspects of these choices especially carefully. First of all, it was indeed on the agenda of the planners to engage new groups that had previously been reluctant to engage in local planning, as expressed by one of the planners:

*"The new would be that you would get some groups involved in the planning work that haven't been involved much before: young people."* Planner, during workshop in A6 (for overview of activities see Fig. 2)

Secondly, we were concerned that the use of smart phone technology would exclude certain user groups. However, the prototyping process essentially addressed the future in a context where not only young citizens are appropriating smart phones. Ultimately, we chose to target young citizens as well as older citizens who did not own smart phones.

We initiated the case study by conducting in-depth interviews with municipal planners and managers (A1 in Fig. 2). We then carried out focus group interviews with the two citizen interest groups (A3 and A4) as well as two qualitative interviews with individual citizens (A11) focusing on the citizens' personal experiences with democratic participation. In the focus group interviews, we used pictures and brainstorming techniques.

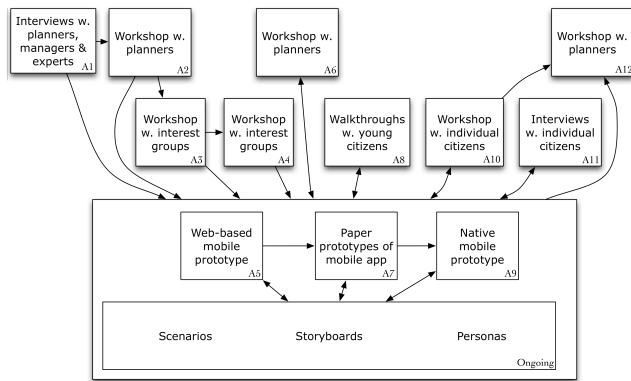
We further carried out several workshops with respectively municipal planners and individual citizens (A2, A6, A10 and A12) to explore the relationship between planning and citizen participation and to motivate the debate further through hands-on exploration of prototypes.

During these activities we utilized a broad set of design approaches including future workshops, extreme scenarios, role-playing games, and cultural probes. As we progressed, we gradually began to narrow our focus, introducing scenarios, storyboards, paper prototypes, and mock-ups of various kinds. We moderated discussions towards concrete examples of actual ongoing planning situations. We constructed role-playing games assigning different roles to citizens asking them to discuss fictive dilemmas and how such discussions might be supported via IT. Concurrently with the paper prototypes, we started developing functional software prototypes for smart phones. With these prototypes, we conducted *walkshops* (in A6, A10 and A12), urging participants to carry out concrete tasks on the phones, such as the creation of issues on maps, while out on 30-minute scenario-based walks in a planning area [13] (see Fig. 1).



**Figure 1.** Citizens and a researcher contemplate a hypothetically proposed building through a 3D visualization.

All of the above approaches contributed to the iterative design process. The prototypes were used as alternative suggestions providing potential users with the possibility of exploring the issue hands-on. Moreover, the prototypes served as a way of probing the context of citizen participation in municipal planning. Apart from thorough notes, we documented the activities with respectively appropriate methods, such as audio and video recordings as well as pictures. This documentation forms the basis of the current paper. Fig.2 provides an overview of the design process.



**Figure 2.** Overview of the design process (activities, participants and design artifacts). The upper and middle levels show activities with planners and citizens respectively. The bottom level illustrates the combined use of scenarios, storyboards, and personas; and prototyping on different technological platforms. The direction of time is from left to right.

### SITUATING REFLECTION AND ACTION

We take the essential challenge of citizen deliberation in municipal planning to be one of supporting reflection and action. Citizens want to understand what the proposed change is about, what it means to them, and how they can act upon the understanding they achieve through various means of reflection and action. We understand these two aspects to be deeply intertwined and interdependent. When citizens grab their phone to contemplate a given proposed change by way of a 3D visualization on top of the physical world this is an action that leads to new ways of reflecting. This is also the case when citizens contribute to a discussion and find their own opinion being challenged or backed by others.

Like any human activity, discussions regarding municipal plans are situated in time and place and dependant upon available resources and personal experience. Such discussions are inherently social and dependent on consorted efforts of several citizens, organized strongly or ad-hoc in various permutations of community groups. Within the case of municipal planning geographical location seems, as elaborated in the section describing municipal planning, especially pertinent. This is due to the fact that practically all discussions are linked to physical locations. Consequently, much can be gained from strengthening the link between the object under discussion, the discussion itself, and the individuals contributing to the discussion. This effort relates to the situatedness of citizens as well as to the actions and reflections they engage in.

Gero references William Clancey’s concept of situatedness as “*where you are when you do what you do matters*” ([11], p. 51). Where citizen deliberation has traditionally taken place at town hall meetings and with citizens contributing from home, as individuals or as groups, this paper explores the potential of making the physical location of the object under discussion and the physical location of the actor contributing to the discussion coincide, i.e. when actors are situated in the environment under discussion. We refer to

this as *in-situ* participation. Hence, we refer to the opposite using the Latin word for “out of”: *ex*. That is, *ex-situ* participation, which refers to planning that does not take place in physical proximity of the object under discussion. We acknowledge that the relationship between plans and situated action is the title and substance of a groundbreaking book within the field of human-computer interaction [20]. However, although we fundamentally agree with Suchman’s perspective, what we address here is a different kind of planning than the kind of planning scrutinized by Suchman [20], namely, possible or problematic scripts for everyday action.

Based on the assumption that the physical context has a significant impact on citizens’ possibilities of reflecting and taking action, it is our hypothesis that partially situating planning discussions in the physical environment will support new means of reflection and action. These means are different from, e.g., town hall meetings and other current means of citizen–municipality communication channels, such as letters and email. Considering Gero’s notion of situatedness, this may actually provide a better support for citizens in deciding what planning issues really matter to them, when they matter and where they matter – that is, when the proposed change is temporally relevant and spatially immediate. We hypothesize that such in-situ participation allows for reflections and actions that make the resulting contribution closely connected to the immediacy of the planning object. Here, Argyris and Schön’s [1] distinction between *theory-in-action* and *espoused theory* seems especially pertinent:

*“When someone is asked how he would behave under certain circumstances, the answer he usually gives is his espoused theory of action for that situation. This is the theory of action to which he gives allegiance, and which, upon request, he communicates to others. However, the theory that actually governs his actions is this theory-in-use.”* ([1], pp. 6-7)

In transformation to our immediate domain, theory-in-action captures the framing and worldviews that people actually apply when they act and we project that this may more easily be captured while commenting in-situ on the actual planning site, whereas espoused theory is likely to be more dominant ex-situ, at a remote location and situation. Schön [17] provides a further distinction between reflection-in-action and off-loop reflection that seems pertinent to the relation between in-situ and ex-situ participation. As the below quote indicates, reflection-in-action allows for capturing surprises and confusion in a different manner than off-loop reflection, or reflection-on-action:

*“The practitioner allows himself to experience surprise, puzzlement, or confusion in a situation which he finds uncertain or unique. He reflects on the phenomenon before him, and on the prior understandings which have been implicit in his behaviour.”* ([17], p. 68)

Reflection and action in municipal planning are, however, by no means explained by a simple juxtaposition of reflec-

tion-in-action and reflection-on-action. We take the two to constitute a continuum affected by performed and potential actions connected to the ongoing process of reflection and understanding. The stimuli that the citizen experiences through the immediate context shape both reflection and action allowing the citizen to, e.g., sense the surroundings and take action by recording rich data (audio, pictures, movies). Consequently, citizens contributing to topics of personal interest in-situ can be understood as reflection-in-action. Such reflection is of a different quality than reflection-on-action, e.g. the citizen sitting in front of a computer with time on his or her hands and the vast amounts of information on the Internet readily available.

Nevertheless, reflection-in-action is not reserved for in-situ commenting; just as reflection-on-action is not reserved for ex-situ participation. Citizens may well act reflectively ex-situ by commenting on the discussion resulting from an issue created earlier in the day, while, e.g., considering their past experience of approaching a particular kind of planning issue or interest group. If and when citizens encounter planning objects in-situ, this may actually lead to reflection-on-action. An example being, a citizen, in the heat of the moment, commenting on a topic regarding a proposed freeway to be put up where she is standing and that contribution immediately making her consider the other sides of the story more thoroughly, after which she adjusts her commenting on the issue accordingly. Consequently, there does not exist a one-to-one correlation between in-situ and ex-situ activity and reflection-in-action and reflection-on-action. For this reason, and for the prospective advantageous qualities of the in-situ as well as ex-situ contributions mentioned above, we argue for the need of combining the two.

As we elaborate in the following sections, we explore such a combination through, firstly, providing an initial trigger by way of in-situ actions through the mobile phone motivated by the spatio-temporal relevance of the planning object. Based on that trigger, a second ex-situ space for reflection and action supports reflective, comprehensive discussions in the form of a desktop application, e.g. visited at home or at work. After a brief discussion of our research methodology, we proceed to describe the two exploratory prototypes supporting this combination of in- and ex-situ reflection and action.

## RESEARCH METHOD

With the outset in a long tradition of participatory design research, we engage in participatory design as part of our research project [8]. Fundamentally, we take design to be a means of probing current user practice and helping formulate hypotheses for how future technology may develop such practices further. Stolterman has explored how to do design as part of research [14, 19]. He discusses the role of theoretical constructs in design and concludes that they are a means for “*preparing designers for action*” [19]. In [14] prototyping is seen as “*framing and exploring a design space*”, by traversing the design space, providing

prototypes that are “*purposefully formed manifestations of design ideas*”. Interestingly, some of these ideas are also manifestations of research. Prototypes help designers sketch and filter design ideas in addition to how they are viewed in participatory design, i.e., as a means of helping users obtain hands-on experience in design [9]. Prototypes are incomplete portrayals of design and research ideas for further research exploration and may further be utilized to challenge current practice through *provotyping* [16].

Schön’s above concern for reflection-in-action and reflection-on-action originally came out of a similar concern for design research [17]. As Schön, we are concerned with the kind of reflection that we make in and on action as designers *versus* as researchers. Furthermore, it is characteristic to participatory design research that researchers act in-situ in the participatory design activities as well as ex-situ, whether this is when preparing participatory activities, building prototypes, or writing research papers.

## PROTOTYPES

The two interconnected prototypes consist of a native mobile application for Android<sup>4</sup> and a web-based prototype for the desktop. Both prototypes access the same information from a server on the Internet and thus provide two ways of viewing the same information based on what is best suited for the situation.

## Geo-centered Discussions

The outset for discussions is a geographically located topic. This topic acts as the collection point for all information, such as descriptions, comments, and pictures. By default, a topic has a creator; a title; a description to start the discussion; a category referencing the overall topic such as infrastructure, construction or childcare; and a geographical reference identifying and delineating the location of the topic. After their creation, topics afford commenting and the adding of pictures (and prospectively other kinds of data such as audio and video). This information is stored in a database on the server. It is such a topic Peter contributes to in the introductory scenario.

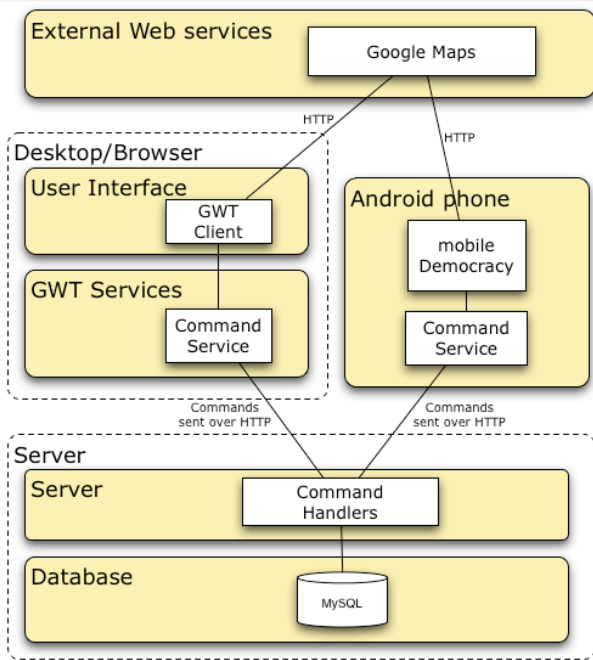
## Software Architecture

The base for the desktop and the Android prototype is a web-server handling requests and serving the topic information over HTTP. An overview of the architecture can be seen in Fig.3. The server has a MySQL database back-end containing all the information regarding topics, categories, users, etc. This information is extracted by a number of services handling commands. These services are accessed through a number of commands constituting the application programming interface (API) utilized by the Android application as well as the web client. The web client was built using Google Web Toolkit (GWT).<sup>5</sup> The GWT service functionality is used to asynchronously fire commands to

<sup>4</sup> Android is a mobile device operating system developed by Google with a high number of supported phones available; cf. <http://www.android.com/>

<sup>5</sup> <http://code.google.com/webtoolkit/>

the server. This asynchronous behavior allows, e.g., for content to be loaded and displayed to the user without reloading the web page and thus supports a more fluent contribution of information by the citizen. The mobile and the web prototype both use Google Maps to display the topic information.

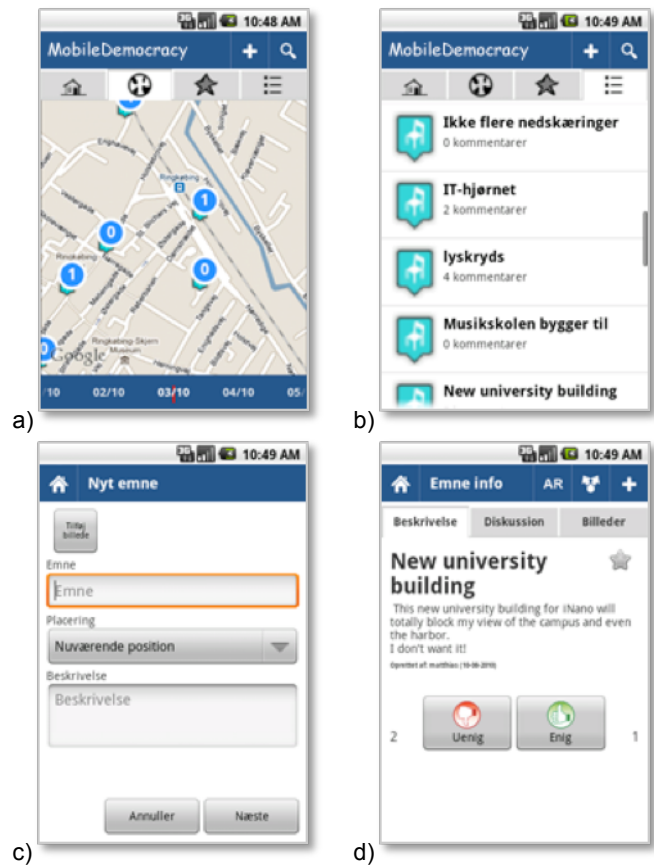


**Figure 3.** The software architecture.

### The Mobile Application Prototype

The mobile prototype has evolved in several steps from paper prototypes over a web-based mobile application to the native Android application. Based on our initial interviews we created a number of paper prototypes from which we later created the first software prototype. This was a purely web-based prototype designed for a mobile browser taking into account the smaller screen real estate. This prototype showed topics on a map and allowed for commenting on these topics. This first software prototype was used to gain feedback from planners in workshop A6. The web-based prototype worked well and had the advantage of being accessible on several platforms. However, as we needed to add more functionality, such as adding pictures from the built-in camera, we decided to create a native application. Here, we chose Android because of the easier deployment to test phones in the development process.

To use the application the user needs an account, which can be created from within the application. From the home screen of the prototype the user can browse topics on a map (Fig. 4a), through a list with all topics (Fig. 4b) or via bookmarked topics. Users may also create new topics (Fig. 4c). The user controls which topics are shown the creation of filters based on categories of topics he or she is interested in. The filter list affects the map view as well as the list view. Topics are also filtered geographically due to the area that is currently visible on the screen.



**Figure 4.** Screenshots of the mobile prototype: (a) the map view, (b) the list of topics, (c) creating a new topic, and (d) viewing a topic.

When viewing topics on the map, small circles with numbers attached to each topic icon indicate the current number of comments. This helps to provide a quick overview of topic activity without having to open each topic individually. The slider located below the map allows citizens to move back and forth in time. Using the slider, topics will appear and disappear and the number of comments will go up or down, thus allowing the user to see how topic activity has evolved over time.

When viewing topics it is possible to express agreement or disagreement with a topic using thumbs up or down (Fig. 4d) and to join the discussion by adding comments. It is also possible to add pictures using the built-in camera. All the information is sent back to the server via HTTP, making it available to other phone and desktop users. The display of 3D models, as mentioned in the scenario, is done using augmented reality. Models of buildings are fetched from the server. GPS and compass information from the phone is used to position the 3D model correctly.

When creating topics with the mobile phone (Fig. 4c), the user can tap on the map to select a location, or it can be based on the current location from the phone's GPS. All information is sent to the server for others to discover.

Users discover topics either by browsing the mentioned list view or map view, or by the application notifying users

when topics are in physical proximity. The application starts a background service when opened, which stays open also after the application is closed. This service monitors the location of the phone and notifies the user if the phone is within 200 meters of a point of interest. Users are asked whether they wish to enable this feature when installing the application.

### **The Web-based Desktop Prototype**

As with the mobile prototype, the desktop prototype has evolved iteratively from a number of paper prototypes into its current state of a functional browser-based prototype. However, up until the writing of this paper most of the evaluation for the desktop has been done on paper prototypes. The main difference between the mobile and the desktop prototype is the way in which information is presented. Given the larger screen real estate of the desktop, it is possible to present more information without having to switch back and forth between views as on the mobile phone.

The basic functionality of the desktop prototype is almost identical to that of the mobile prototype. Discovering topics by using the web prototype is done by browsing either the map directly or by switching to the list view using the tabs located above the map. Here, the list of bookmarked topics allows for users to reconnect to topics discovered on the go. Additionally, the website tries to retrieve the geographical location from the browser and, if indeed supported, centers the map on this location. Nevertheless, because this will inevitably be a static location, browsing of topics may still be done manually on the map and the list views.

### **PROBING MOBILE DEMOCRACY THROUGH PARTICIPATORY DESIGN**

We have already indicated that the task of identifying which users to involve in this kind of design setting is less straightforward than it might seem. Initially, we chose to involve citizens who had prior experience with democratic participation within municipal planning in the form of interest groups. This was a matter of relevance as well as a matter of choosing settings where it was possible to target real dilemmas and experiences. Gradually, we began to supplement these user groups with other, less democratically active citizens that were more easily accessible to us as researchers simply because they were not as physically distant as the inhabitants of the participating municipality.

A research/design process as the one presented in this paper is indeed in itself a process that combines in-situ work (e.g. interventions with users) with ex-situ work (e.g. analyzing interviews, building scenarios, prototypes, etc). Within this research process reflection-in-action very much regards steering the course of the process and making the necessary design decisions. Conversely, reflections-on-action manifest themselves in research papers like this one. To illustrate how these dynamics played a role in our design/research process, we turn to two salient examples. These were moments where we as designers and researchers learned things in and from design that provided new insight

into municipal planning and/or changed the course of the design process: a change in the methods applied and a change in our understanding of Mobile Democracy as it is hypothesized and/or crystallized in interim design products, e.g. the prototypes.

The very first hands-on prototype presented to planners was a web-based mobile prototype, where all planning objects were shown as pictures. The planners explored this prototype in a future workshop (A6 in Fig. 2). Here it became clear that it was desirable to be able to show more of the future state of the planned objects than simple static pictures. In the future workshop the planners contemplated several futuristic ideas all pertaining to better visualization and the provision of an overview of proposed changes. Based on background readings, we proposed to work with 3D models for contemplation at site *through* the smart phone. The workshop participants found this idea intriguing, but wanted to know more. Following up on the idea after the workshop, we realized that we needed to better understand what such 3D models would do for users. Moreover, if we were to succeed in constructing a running prototype, it would entail moving from the mobile web platform, which we were developing for at the time, to a native platform. Therefore, we decided to proceed utilizing a combination of paper prototypes (A7), and the much more time-consuming Android prototype (A9).

During the workshop that spawned the idea of the real-time 3D modeling (A6), it also became apparent that there existed a need to quickly be able to gain an overview of user activity within the system. The planners wanted to be able to see the level of activity so that they could quickly see where discussions were heading. This led us to contemplate the visualization of activity. The result was the addition of the number-of-comments annotations in circles (Fig. 4a).

The above examples illustrate how our personal reflections-in and on-actions as designers lead to changes in the methods applied as well as a change in our understanding of Mobile Democracy as it is hypothesized and/or crystallized in interim design products: neither 3D models, nor the visualization of activities were considered in the initial phases of the design process. Rather, they were incorporated into the prototypes as a consequence of the discussions between users and designers and the following ex-situ reflection-on-action carried out by the involved designers. A central challenge in this kind of process is to decide which users to work with considering which users one is actually designing for. Moreover, designers need to be prepared to revise methods and choice of technology due to the overall design ideas.

We now turn our attention to the role and support of reflection and action in the presented design process with a view to the prototypes. Concretely, we discuss to which extent the exploratory prototypes support the continuum of in- and ex-situ reflection-in and reflection-on-action.

## SUPPORTING REFLECTION AND ACTION IN MUNICIPAL PLANNING

Much work has been done around the context of map-based community discussions and map-based citizen deliberation in general. An example of this is Yu and Cai [22], who provide a comprehensive literature study of map-based community decision-making. Through this study and their own design experiences they derive a set of requirements for systems supporting deliberative efforts regarding map-based community decision-making (see Fig. 5). However, the novelty of our design is just as much in the linking of in- and ex-situ participation as it is in the facilitation of democratic participation in municipal planning in general. With an outset in the difference between our focus and that of Yu and Cai, we use the proposed requirements as a vantage point for a discussion of the specific challenges to supporting a continuum of in- and ex-situ participation within municipal planning by way of reflection and action.

Yu and Cai make the case that geo-spatial technologies have become important instruments for decision-making in local communities. They do so by way of a thorough review of cases where GIS technology has been used to support such decision-making. That is, participation understood as *“the public right to know”*, supporting citizens in expressing their opinions by engaging in discussions with decision-makers. Based on their review, the authors propose seven functional requirements as well as two social requirements relating to the encouragement of participation:

### Functional requirements:

- R1: Capability to integrate heterogeneous geospatial information and create customized maps
- R2: Support for multi-modal multi-media information sharing
- R3: Support for explicit linkage between arguments and geographic references
- R4: Support for structured discussion
- R5: Capability to record contextual information about arguments
- R6: Support for combined geo-argumentative query and navigation
- R7: Support for advanced visual analysis

### Social requirements:

- R8: Easy to access and use
- R9: Capability to allow the user to control sharing level

**Figure 5.** Requirements for map-based online discussion spaces proposed by Yu and Cai [22].

To a large extent, we agree with the findings of Yu and Cai. However, our design interventions point towards the necessity of strengthening the link between reflection and action at the site of the planning object as well as during more geographically remote participatory efforts. This essentially has to do with the fact that no system can render fully comprehensible to all citizens the nature of a proposed change in the physical world. Much less can any system fathom the infinite complexity of the physical world and the way in which we as individuals interpret this complexity and any proposed change in it. A citizen made an illustrative remark while contemplating a 3D model from different angles on a nearby field through the camera of his phone:

*“If you have this view, you can imagine how much space it takes up in the landscape!”* Citizen, during a workshop at A10

Shortly after, another citizen added that she would like to be able to share a picture of her individual, in-situ view of the 3D model with other citizens:

*“You could send a picture out to other people from where you are standing [...] to start the discussion with the ones who are not standing [here].”* Citizen, during a workshop at A10

Essentially, the citizen is referring to the possibility of corroborating the case that a citizen might be trying to make by rendering more comprehensible the link between the physical immediacy of the planning object and the argument put forward. In other words, a picture of the 3D model would serve as a small brick in a bridge to cover the gap between in-situ and ex-situ planning efforts. A small step in the direction of exposing the way in which *“being there”* helped fathom the complexity of the planning object shaping the citizens reflection and action.

As a general rule, concrete topics within municipal plans are always linked to or set within this complexity. Returning to the proposed requirements (Fig. 5), most of these essentially regard the support of collaboration through the best possible capturing of the complexity of the planning object. Hence, R1, R2, R3, R5, R6, and R7 all pertain to the conceptual linking of (rich) data to physical locations as to support discussion. Nevertheless, there seems to be a big difference between the situation that, in the words of Schön [17], *“lies before”* the citizens when they are sitting in front of their computer at home and when they are physically and sensually immersed in the context under discussion. Some things are best understood and acted upon at a distance, others require proximity. Furthermore, municipal planning as well as the community-based decision-making processes referred to in [22] ought to be understood as inherently collaborative. The above quote regarding the space a building would be taking up in the landscape illustrated the comprehension of a surprising realization of what a municipality might actually be proposing. This is a salient example of the aligning of understandings and incentives that constitutes the crux of collaboration in participatory decision-making.

To an extent R7 addresses the above challenge. Specifically, it relates to the provision of a visual representation of the developments in a given discussion as a means to *“help the user understand the problems, detect conflicts or potentials, and deliberate the solutions based on existing arguments”* ([22], p. 218). While this is a sympathetic aim, the requirement says little about how users are to be aided in discerning what the actual challenge is and how it is linked to the actions and incentives of other individuals. Citizens’ incentives for engaging in participation are multifarious and, as one citizen hinted during a walkthrough, the ability of the single citizen to fathom the complex incen-



tives of other citizens may very well play a significant role in their own willingness to engage:

*"I don't bother to engage in the discussion, if I know I will never agree with them [the other people participating]."* Citizen, A10

Whether a prototype such as Mobile Democracy should try to commensurate disparate opinions and lessen the polarization and insularity of interest groups is an interesting discussion that we briefly touch upon in the section on perspectives and future work. For the purposes of the discussion at hand, the above quote illustrates the way in which citizens navigate the collaborative spaces that De Cindio and Peraboni [10] refer to largely by reflecting on the actions of others. Up until the design process was commenced, the municipality had, apart from town hall meetings, mostly depended on the one-way provision of information. Apart from the largely unused possibility of personally contacting planners, the municipality supported neither community spaces, nor deliberation spaces. However, citizens involved in the design process would consistently express the need for such spaces. Much like the citizen not wanting to engage in collaboration with individuals she knew she would never agree with, citizens generally navigated, acted, and reflected with a view to the activities of others:

*"Where it could be valuable is in the combination with our [the local parish community] webpage. Then you will get the last bunch of people to participate. Because you can spike the interest there."* Citizen, A10

Municipal planning is a collaborative activity that, in its entirety, involves a potentially large and heterogeneous group of stakeholders in the negotiation of a present and proposed future order in the physical world. The arguments used in the negotiation of this order are often egotistical, value-driven, and political. This is a complex landscape to navigate for the single citizen. Add to this the fact that only few citizens have a sense of why they should engage at all, that is, why municipal planning matters to them. It is then no surprise that less than one percent of the municipality's population participates in the municipal planning. The aim should by no means be 100 percent participation. However, much pointed in the direction that municipal planning did matter to many more citizens; only, they did not become aware of this until it was either too late or until decisions were very hard to reverse.

#### **Bridging the Gaps in Democratic Participation**

The support of combined in- and ex-situ reflection-in and on-action is a step in the right direction towards helping citizens understand why proposed changes matter. However, an immense challenge also lies in bridging the gap between superficial and profound participation. Several scholars have taken the conceptual approach of dividing citizen engagement into levels (e.g. [2, 7]). The Mobile Democracy prototype is a concrete attempt at bridging the gaps between such levels. The ludic aspects of in-situ augmented reality through the mobile phone can help

provide an initial trigger for superficial participation, such as acknowledging agreement through a "thumbs up". Such initial participation can then be followed up by the support of deeper, collaborative reflection with a view to community and deliberation spaces, e.g. through ex-situ action via the desktop application, which may help inspire the citizen to increase his or her engagement. Here, the sense that one is engaging in meaningful activities with other citizens with a common cause is a strong motivation:

*"[...] there isn't any doubt that it mattered that there were other people involved."*

*[Interviewer:] It kept you at it?*

*[Citizen:] Yes, and gave me a greater patience."* Citizen, A11

Sharing information outside the system could play an important role in allowing for discussions and collaboration to proliferate where and when it is needed. This may be accomplished in a number of fashions, such as sharing pictures of in-situ 3D views, combining the system with the local community web page, or as a third citizen suggested, supporting the easy creation of posters to put up in the local supermarket. The value and nature of such dissemination of information outside the system would have to be explored in particular local communities.

#### **CONCLUSION**

This paper has presented an exploratory design process in a municipality regarding public deliberation in municipal planning. Through the development of two interconnected prototypes, we probed the challenges to such citizen participation combining prototypes for smart phones and desktops. The support of in-situ and ex-situ participation allows citizens to engage in continuous reflection-in and on-action as a collaborative activity with other citizens, hereby inspiring citizens to increase their democratic engagement.

#### **PERSPECTIVE AND FUTURE WORK**

The support of collaborative citizen participation is an immense challenge that relates to a number of issues of which this paper has only touched upon a few. Nevertheless, there are specific challenges that seem especially pertinent to the work presented here. Firstly, many scholars (see e.g. [3]) have argued that the promised democratic revolution based on the Internet and e-government and e-participation services has failed to manifest itself. As such, it can be argued that the superficial participatory tendencies on the web today, such as "liking", "digging", joining groups on Facebook, etc. are in fact not instances of democratic participation, but citizens constructing self-promoting, digital identities. Whether the *triggers* explored in our prototype only support instances of such superficial participation, or if they are in fact necessary first steps to including groups of actors who are not prone to participate today, is a question that remains to be explored. Consequently, we are currently preparing a series of design workshops where young citizens with moderate or no prior experience with

democratic engagement will be asked to use the technology in order to settle existing local issues in the surroundings of Aarhus University. This will hopefully provide valuable insight regarding the prototypes' potentials and challenges pertaining to the very different prospective user groups.

Secondly, it seems many current e-participation solutions inadvertently strengthen the divide between citizen interest groups. Keeping in mind the fact that all technology shapes the actions of its users, to what extent should a system supporting democratic participation aim to mitigate such polarization?

When push comes to shove, the idiom "you can lead a horse to water, but you cannot make it drink" also applies to democratic participation. At the end of the day, technological tools aimed at supporting participation are no better than the action and reflection they trigger and support. As argued by, e.g., De Cindio and Peraboni [10], the crux of prolific citizen deliberation is not technology, but the juxtaposition and alignment of citizen and government incentives for engaging in collaboration in the first place. However, prototypes such as the ones presented in this paper constitute valuable tools in the investigation of such incentives for democratic participation.

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